Electrical Review

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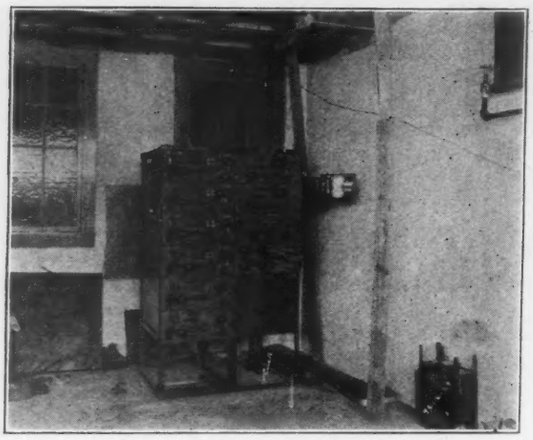
Methods Used in Modern Electric Vehicle Service Station

Service Company Provides Batteries and Maintains Them in Good Condition—Two Methods of Charging Employed—The Future of Electric Vehicle Industry Influenced by Gasoline Cost

In an effort to insure improved service and efficiency, the Electric Truck Service Co., Boston, has inaugurated an effective method of conducting its electric-vehicle charging and storage business. The concern using the trucks must buy them, but the service company furnishes and maintains the batteries. The customer is billed for the battery plus a small fee and $0.02 per ton mile of haulage. Storage space is charged for at the rate of $40 per month. The customer may call for a fresh battery at any time, service trucks being maintained for the purpose of replacements at any time if the need should arise.

In addition to the original station on Atlantic avenue, a new station was completed last spring on West Dedham street, the latter being a modern fireproof building as may be seen from the illustration. Besides the general charging section there is a repair shop, carpenter shop, locker room with shower baths for company and customers' employes, and a battery-repair room with charge and discharge rheostats. The large charging board in the basement consists of 42 sections for lead batteries. On the first floor there are 42 additional sections for lead-battery vehicles and a six-circuit panel for Edison-battery vehicles. For the lead batteries of 40 to 44 cells the range of charging current available is 90 to 18 amperes. For the Edison batteries the range is 180 to 30 amperes. Charging sections are numbered to correspond with numbers at the charging outlets located about the garage, but the attendant at the centralized board makes all adjustments of charging rates, takes readings and keeps records for

Illustration Showing Batteries Removed From Trucks and Being Charged.



Charging Board Used in Connection With Battery Repair Work.

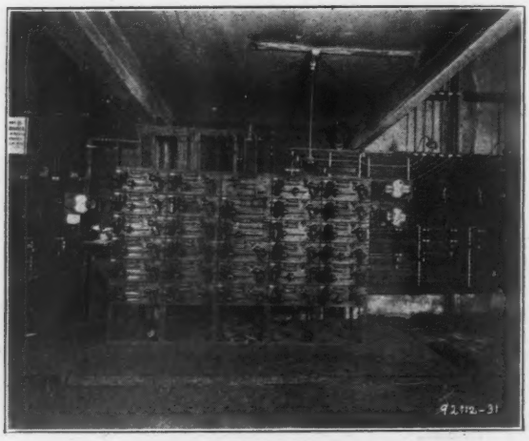
all vehicles. Service is supplied from a 220-110-volt, three-wire, d-c. system, the attendant keeping an approximate balance on the two sides of the circuit.

The Atlantic avenue station has 27 charging sections with several special charge and discharge sections. This switchboard is shown in an accompanying illustration, and the method of placing batteries on skids for charging is indicated in the view of this station.

Batteries Removed from Truck to Save Space on Floor.

In this garage, because of lack of space, batteries are frequently taken from the trucks and carried to the charging outlets. From the central charging board the attendant can handle the entire charging. As in the other station the constant-current or variable-resistance method of charging is employed. Each of the control units is 24 ins. wide by 10 ins. high, the panel of six units with its angle-iron frame being 6 ft. 8 ins. high. Each unit is complete in itself, having a low-current cutout, slider-type rheostat, instrument switch, grid-type resistors, indicating lamp, battery and instrument fuses, and card holder for numbering to correspond with the number at the plug to which the vehicle is attached.

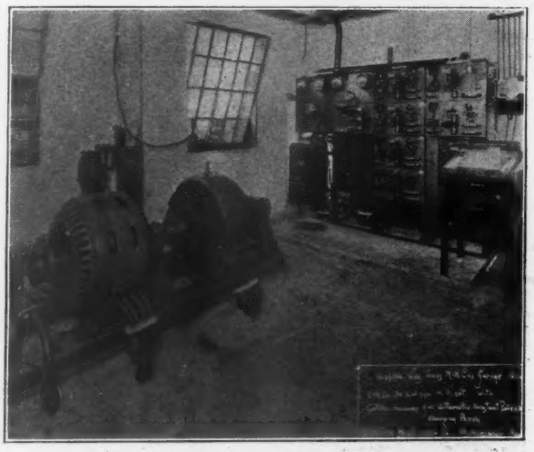
The current is kept approximately at the normal charging rate until the battery voltage reaches a predetermined value. For lead batteries the charge is then continued until the battery voltage reaches full value by lowering the charging current rate to from 0.33 to 0.25 of the normal rate. For Edison batteries the normal rate is continued until the full voltage is reached. The rheostat can be adjusted by the attendant to give the proper charging rate regardless of fluctuation of line voltages, the demand on the power system being uniform with this method of charging.



Battery Charging Board in Garage of Electric Truck Service Co., Boston.

Modifed Constant-Potential Charging System Becoming Popular.

The modified constant-potential system of charging is gaining favor in small garages where no regular attendant is present to regulate the circuits. This method takes advantage of the fact that the voltage of a battery is low when run down or nearly discharged, and when it is charged the voltage is high. The battery is connected to the circuit with one or two steps of resistance in series. The current supplied to the battery is high at the start and tapers down gradually to a low rate as the voltage of the battery increases. Where two steps of resistance are used in the charging section one step is cut out after charging for a given period.



A Six-Circuit Modified Constant-Potential Charging Equipment.

A panel made of four charging sections for modified constant-potential charging is shown in an accompanying illustration. With this type of equipment the charging is started by inserting the charging plug into the receptacle with the instrument switch on the section corresponding to the receptacle moved to the "on" position. This energizes the voltage relay which, if the supply voltage is normal, closes the magnet switch and allows current to flow to the battery through the resistance.

Charge Terminated by Instrument Mounted on Truck.

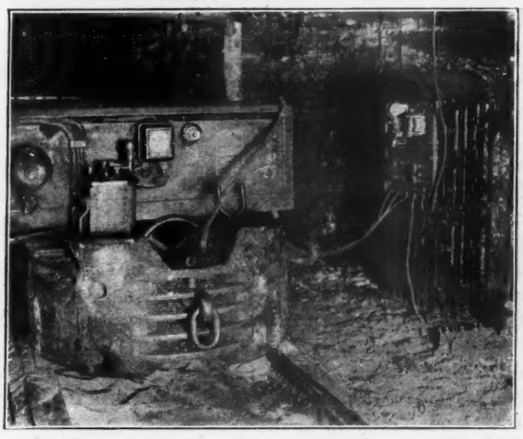
An ampere-hour meter located on the vehicle, where this method of charging is used, automatically stops the charge when completed. This meter indicates the condition of the battery when it comes in by showing the service in ampere-hours taken from the battery. The needle of the meter moves forward as discharging takes place, and moves backward while the battery is being charged. As it reaches the zero mark a contact is made with an electrical trip relay on the charging

Garage of Electric Truck Service Co., Boston—Charging Panel at Left.

panel which opens the main magnet switch and disconnects the battery from the line.

The attendant only needs to connect the battery and close the switch on the charging section, disconnection when the charge is complete being taken care of automatically. Even the starting of the charge may be made automatic by replacing the hand-operated switch on the section by a magnetic switch so connected that the charge starts when the battery is plugged into a receptacle.

An automatic equipment of this kind made up of six charging sections, located in the garage of



Charging Panel Used in Connection With Mine Locomotive.

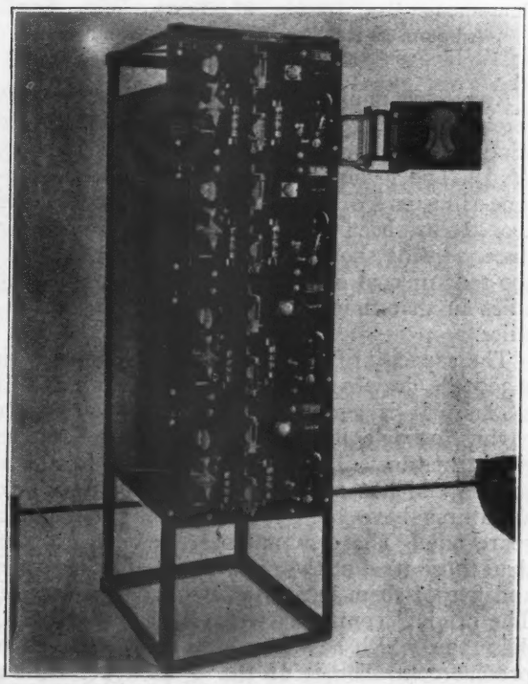
the Supplee-Wills-Jones Co., Philadelphia, is shown in an accompanying illustration. The trucks served by this plant were made by the Commercial Truck Co., Philadelphia, which company advocates the use of the modified automatic constant-potential system of charging. With an ampere-hour meter and circuit-breaker on the truck the charge is terminated without attention.

Future of Electric-Truck Business.

About 400 electric vehicles are needed yearly by express companies to take care of replacements and additions, but for three or four years this equipment has not been purchased. This alone indicates a long period when demand will exceed the output of the present plants.

A daily mileage for a truck of 40 mi. or less is best covered by an electric vehicle, while, at least in normal times, delivery beyond 40 mi. can be cared for more cheaply by railroads. For this latter service gasoline trucks are today doing all that is possible and will continue to do so up to a radius of possibly 75 to 100 mi.

For service in cities like New York, Chicago, Boston and Philadelphia, electric-truck delivery has the best opportunity to demonstrate its worth. In a test conducted by the publisher of a weekly



Unit-Type Equipment for Modified Constant-Potential Battery Charging.

periodical, covering a period of six months, a 5-ton electric truck averaged 70 tons of paper hauled per day as compared to 52.5 tons for a 5-ton gasoline truck. This haulage was through the thickest traffic and over a triangular route where many stops and delays were encountered because of traffic conditions.

Increased cost of gasoline has been a factor in developing a market for electric taxicabs, one manufacturer turning them out at a steady rate for service in Spain. Gasoline is sold at $1 a gallon in that country while energy for charging batteries can be purchased at the rate of $0.015 to $0.03 per kw-hr. A speed of 20 mi. per hr. is the maximum, but tests have proven this to be ample for the usual taxicab service of large cities.

Moderate Speeds Limit Maintenance Costs on Truck and Roadway.

Discussing maintenance of electric trucks, manufacturers bring out the point that excessive speeds, resulting in wear and tear on the truck, tires, axles, etc., are not possible. Also that the wear on pavements is much less when speeds of 20 mi. per hr. are not exceeded, damage varying with the square of the speed and being four times as much at a speed of 24 mi. per hr. as at 12. Electric trucks rarely exceed the latter speed.

With the present demand which is greater than the supply, and the increased use which will come about because of the cost of gasoline, there is little doubt but that the manufacturers of electric trucks will need to expand and that new manufacturers will enter the field. In fact, some gasoline-truck manufacturers are said now to be contemplating the addition of lines of electric vehicles to their present output.

ELECTRIC MINING LOCOMOTIVE HAS SERVICE RECORD.

Continuous Use During 27 Years, With Small Amount of Repairs, Keeps Coal-Handling Costs at Minimum.

An electric mining locomotive that has a unique record for service is at present operating in the mine of the Union Pacific Coal Co., Rock Springs, Wyo. The locomotive was built by the Thomsone-Houston Co. and was put in service 27 years ago. It has been giving continuous service ever since, records showing that it has hauled 3,712,500 tons of coal over an average distance of 1.5 miles in that time, or a total of 5,568,700 ton-miles.

The capacity of the locomotive is 9 tons, with a 3000-lb. drawbar pull and a wheel diameter of 28 ins. It is equipped with a 500-volt motor having a single field coil, and the old Gramme ring armature. The original field coil is still in service and has never given any trouble. Two armatures have been used, the original and a spare one. The commutators are much smaller than those used at the present time for 500 volts and five of them have been worn out in service. The original controller was of the semi-circular disk type, which has since been abandoned. The present controller is of the drum type, with a pancake resistor. The original brake rigging is still in service and the gears have also given excellent service, as only three of them have been worn out.

The locomotive is equipped with semi-elliptical leaf springs, which support its weight on the journal box. It has been used on a very rough road but they have had comparatively little trouble due to the breakage of springs.

It has also the low record among the locomotives used in the mines of this company for repair charges, and consequently in cost per ton of coal hauled. In fact, it is held to be just as efficient in operation as any of the recently designed locomotives in the company's service. The feature that is held largely responsible for the low upkeep is the use of the semi-elliptical leaf spring construction. It is interesting to note in this connection that the General Electric Co. has returned to this design in its trolley locomotives, with the addition of an equalizer bar to distribute the weight more evenly.

FRENCH HYDROELECTRIC PLANT TO DEVELOP 5500 HP.

A hydroelectric plant of 20,000 hp. has recently been completed by the Societe Hydro-Electric of Lyon, a branch of the Compagnie du Gaz, Lyon, and the Compagnie Continentale Edison of Paris. The plant is located at Seyssel, Haute-Savoie, France. Importance is attached to the completion of this project because of the present scarcity and high prices of coal, and likewise because of the effect it may have toward encouraging similar undertakings in France. The plant is equipped with four turbines, each capable of developing a force fo 5500 hp. It is proposed to install another turbine at an early date and thus increase the production of 27,000 hp., an amount that equals almost one-third of all the energy consumed under different forms by the city of Lyon.

CIVIL SERVICE EXAMINATION FOR ELECTRICIAN.

The United States Civil Service Commission has announced an open competitive examination for electrician, applications for which will be received until further notice. The duties of the position require a knowledge of materials, operation and especially maintenance and repair of electrical apparatus generally used as equipment for public buildings, including generators, switchboards, distribution of wiring motors, etc. Those desiring to make application should write to the commission, Washington, D. C., asking for form 1800 and mentioning the title of the examination desired.

MILWAUKEE SECTION OF A. I. E. E. ELECTS OFFICERS.

The following officers have been elected by the Milwaukee Section of the American Institute of Electrical Engineers to serve during the coming year: Chairman, W. H. Cheney, Allis-Chalmers Manufacturing Co.; secretary, W. H. Costello, Cutler-Hammer Manufacturing Co.; membership committee, R. L. Dodd, Milwaukee Electric Railway & Light Co., chairman, and program committee, Fraser Jeffrey, Allis-Chalmers Manufacturing Co., chairman.

Contractor-Dealer Co-operation With Utilities

Prosperity of Central-Station Companies Vital to All Other Branches of Electrical Industry as Well as General Public—Paper Presented at Convention of Indiana Contractor-Dealers

By MORSE DELLPLAIN
President, Indiana Electric Light Association.

Electrical contractors and dealers are vitally interested in the new business policy of the local electric light and power company in their several communities. This policy will depend absolutely on whether or not there is any money in new business. One cannot expect intelligent business men to invest money in extending their business if they cannot see a reasonable profit in so doing. If there is not a reasonable profit in business, a policy of retrenchment is to be expected on the part of business men. A policy of retrenchment on the part of utility operators means a curtailment of business for electrical contractors and dealers. Therefore the latter should be and probably are very definitely interested in the question of what they can do to prevent a policy of retrenchment being adopted by the utilities in their several communities.

To summarize in a simple statement, a prosperous utility will always be found ready to keep up with the growth of the community; in fact, it is usually several laps ahead. Contractor-dealers are all, therefore, interested in the question: "What makes a prosperous utility?" The answer to this question is: "Plenty of business at adequate rates."

Contractor-dealers may be heard to say: "That's nothing new; that's true of any business." Exactly; but for some reason or other the general public has failed to appreciate that the utility business is subject to the same laws that govern every other business, whether individual or corporate. It has become necessary for utility managements to indulge in the commonest sort of bromides in order to get their story to the people in whose hands the prosperity of the utilities, or lack of it, rests today.

Intelligent Co-operation Necessary in Electrical Industry.

Electrical contractor-dealers, forming as they do a distinct part of the general public that should be able to readily see the utilities' viewpoint, have a part to do to help the utilities in their communities to be prosperous, keeping in mind that the benefits must be mutual to be effective.

How can the electric utilities have plenty of business? Intelligent co-operation between the several members of the electrical fraternity is the greatest single force for increased business in the electrical field. For a business man to address a body of business men on the subject of co-operation these days is often looked upon by the attorney general's office and the general public with suspicion, but it is believed that they will find no objection to the kind of co-operation here under consideration. This is a co-operation which automatically comes from the placing of the central-station business on a sound economic basis not only in the interest of the holders of the property but in the interests of the people as a whole.

Co-operation is defined by Webster as "the act of working together to one end, or the act of working with mutual efforts to promote the same object." In order to co-operate intelligently, therefore, it is necessary first of all to determine the end toward which we are working and the object which we are seeking to promote.

There is not much difficulty in securing co-operation when the end in view means a net gain to the side whose co-operation is requested. But the co-operation always stops when the result fails to be a net gain to the parties co-operating. This is simply the expression of an economic law. It happens, however, that in most attempts at co-operation the parties concerned are unable for various reasons to discern the distinction between apparent loss and ultimate gain.

Immediate Results of Co-operation Not Always Discernible.

What is in reality ultimate gain often looks like loss until a closer analysis is made to reveal the true conditions. Conversely, an apparent net gain may prove to be, through mature experience, a decided loss. For example, a policy which central-station companies adopted in the early days—that of selling appliances at cost and very often at less than cost, through the mistaken idea that the business obtained through increased current consumption would more than offset the demoralization of the appliance business in the territory.

That such a line of reasoning was unsound is realized by most of the central-station companies. They have found that the apparent benefit of cut prices in the early days has since proved a serious handicap to legitimate merchandising. It would be unfair to say that no good has come of the old practice, as to it is probably due much of the present-day knowledge and popularity of electrical appliances with the general public. There is a question, however, whether the same results could not have been accomplished through more businesslike means.

Under present conditions of the appliance market there can be no excuse for selling appliances otherwise than on a sound merchandising basis and at a price which will allow a reasonable profit

for those who must depend entirely upon the merchandising business for a livelihood. Such merchants are entitled to a fair return upon their investment as well as for their labor and initiative.

To have successful co-operation it is essential that the end to be attained and the object to be promoted shall be clearly defined, that these be based on economically sound principles and that the parties concerned fully appreciate the difference between an immediate but short-lived benefit and a possibly delayed but permanent advantage.

Basic Principles of Successful Electrical Co-operation.

The end to be attained and the object to be promoted through the co-operation of the electrical fraternity is the placing of the electrical business on an economically sound basis with regard to the public utilities, electrical appliance and construction merchants, both wholesale and retail, as well as the general public. To bring this about is a comparatively simple matter. It calls, of course, for a full expression of the opinions of each of the various branches of the industry and a subsequent analysis of these opinions from a sound economic standpoint. But there are one or two fundamental principles which can be accepted as basic facts.

In order to continue in business it is necessary to make a return upon the capital invested as well as a proper profit for the labor involved. Any concern, electrical or otherwise, that does not keep this fact foremost in mind must of necessity be a failure sooner or later. Another fundamental principle is that the public has a right to demand value received for the price paid. An electrical contractor cannot expect to stay in business if his work does not measure up to present-day standards, and one cannot fail to note that these standards are being raised every day. This is again simply the working of an economic law.

In the public utility field the standards of service are constantly being raised so that today a central-station company is forced by public sentiment to maintain service in all its branches at the very highest point. This holds true throughout the merchandising field. The standards of service in every branch of the business, even in the most humble community, have been raised many fold in the past decade.

The buying public is vitally interested in these matters. A community that can depend on its electrical industries to invariably do good work and supply only first-class goods can establish a national reputation which would be truly enviable. It is within the power of the electrical fraternity, through the electrical contractor-dealers, to accomplish this, and the business men and the general public can be depended on to do their share in promoting any object which means the upbuilding of any legitimate industry in the community.

Central-station companies have, almost from the start, maintained high standards of quality in the electrical appliance field. Manufacturers of inferior goods have found no market for their wares among the central stations and have been forced to dispose of them to less discriminating purchasers. It is to be regretted that much of it was placed with inexperienced contractor-dealers who were just launching into business and who had as yet no opportunity to benefit by membership in an association.

Where central-station companies have undertaken electrical construction work in the past in self protection, they have invariably maintained high standards for this work and have found it as easy, and far more economical, to sell good appliances and do first-class work as to sell inferior goods and do second-rate work. If the central-station companies have found this to be true, why is it not possible for the jobbers, dealers and contractors to do the same? It is possible, as many have discovered.

It only remains for all interests to get the broad viewpoint that comes from having the business on a sound economic basis. To do this it is necessary to find out if the stock handled is first-class, whether the advertising is what it should be, whether full value is being given for every dollar received, whether the goods are being tastefully displayed, whether full knowledge of the costs are at hand, whether there is a full appreciation of the vital distinction between fixed charges, wages and net profit and, finally, whether central-station company or contractor-dealer is assured that other citizens, especially competitors, can say that the game is being played fairly. If the answer is "Yes" to all of these, there is little need to worry about lack of co-operation for it will be found that the results to be obtained through proper co-operation have always been here if simple economic laws are only allowed a chance to work.

Lack of co-operation is due to the fact that there is not being kept in mind the end to be attained or the object to be promoted. Those in the industry who have analyzed this subject carefully and have studied the problem in its several phases have had little difficulty in appreciating the value of the above fundamental principles. Those who have not given these matters consideration can well afford to adopt them on faith and determine their soundness through personal experience.

When the electrical fraternity in a community learns the working of simple economic laws and allows these laws to function, the utilities will have plenty of business and the contractor-dealers will have all the business they can possibly handle.

Creating Public Demand for Adequate Utility Rates.

The next question is: "How can our utilities obtain adequate rates?" The best answer to this question is: "A demand by the people that the utilities receive adequate rates."

Creating this public demand is something which contractor-dealers have it distinctly within their power to accomplish. No one comes so closely in contact with the people of their several communities on matters electrical as the contractor-dealers and their employes. Any comment which they or their employes make with regard to the local utilities is always accepted as 100% gospel or more, as it carries the weight of one speaking with authority.

How often does it happen that a local electrician will make a disparaging remark regarding the local utility, little realizing that the remark,

accepted at its face value by the layman and passed on to hundreds of others, tends to create public sentiment against the utilities with the result that any application for a rate increase encounters at once an antagonistic public sentiment. Public sentiment strongly opposed to a local utility makes it next to impossible for the public service commission to deal fairly with this application. This in turn leads to a curtailment in the extension policy of the central station, with a consequent curtailment in work for the same electrician who was in part responsible for the existing condition.

We are all interdependent and little do we realize the power of even the most humble among us for good or evil. As an example, there may be cited the apparent opposition on the part of the citizens of Indiana to having the utilities of the state fairly dealt with, an opposition which has seriously affected the ability of these utilities to borrow money with which to extend their plants and distribution systems.

Unless confidence can be restored in utility securities through an improved public sentiment and by increased net earnings, investment in these securities will be at a minimum for the next few years. Extensions must then necessarily be restricted and the communities will suffer along with the individuals directly affected.

Upkeep of Utility Equipment Depends on Sale of Securities.

It is not generally comprehended that the average utility company must expend upon equipment $1 for every 20 cents of gross revenue—total receipts in the form of charges—that it receives in a year. The balance sheet of the nearest company will disclose this fact. That equipment is a permanent fixture in the community. It is paid for by the sale of securities to thrifty investors. It could not possibly be paid for out of earnings. That can readily be seen by any fair-minded man.

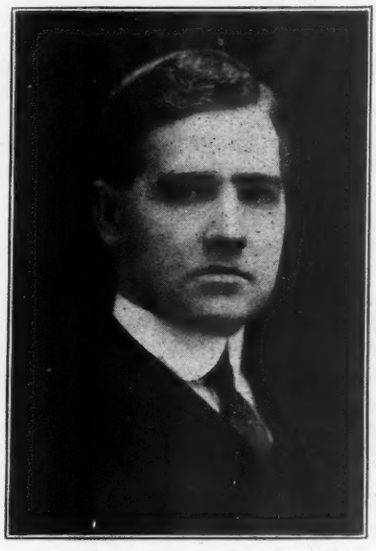
With money available only at prices averaging 10% or over, how can utilities expect to borrow any of this money if the people's representatives insist that 6 and 7% on a greatly depreciated valuation shall be considered a reasonable rate? Contractors and dealers should thoughtfully consider this problem in the interests of their local utilities whose prosperity holds such a close relation to that of their own business.

In Indiana as well as in some other states there has, at every session of the legislature, appeared a movement for the abolishment of the public utility commission—why? Simply because the commission has found itself, due to economic conditions, forced to grant some meager rate increases in order to keep the utilities of the state from bankruptcy.

One would sometimes think that it was criminal for a public utility to be prosperous. As a matter of fact a prosperous condition is the most desirable from the standpoint of everybody concerned—the public served by the utility as well as the owners of utility property. If it is not prosperous, not alone will the holders of securities suffer but the employes will suffer by failure to secure adequate wages. The public will also suffer from lack of service because the utility cannot secure adequate extensions of plant and service. One cannot but feel that the antagonistic movements originate, not with the intelligent and reasoning citizens of a community, but rather with the uninformed masses, being fostered perhaps by some prejudiced person or a selfish politician more interested in his own personal plans than in the community which he represents.

Industrial Prosperity Depends Upon Prosperous Utilities.

No city or town can be more prosperous than its utilities. If its utilities are "starved" and unable to furnish adequate light, heat, communication or transportation services, the city immedi-



Morse DellPlain.

Resolution Prompted by Morse DellPlain's Address Before Indiana Contractors

BE IT RESOLVED: That the Indiana State Association of Electrical Contractors and Dealers give their immediate moral and active support to the various public utilities of the state in the sale of their securities, and be it further

RESOLVED: That this association shall individually and collectively promote the good-will of said utilities with the public for the purpose of promoting the sale of their securities and securing adequate rates for service.

ately feels the effect. Paralyze any one of these services by causing it to be entirely suspended, and consider what would be the effect upon all business, and upon the convenience, happiness, contentment and habits of every citizen—man, woman and child.

When a utility company is abandoned, suspended or becomes bankrupt in any community the financial effect is widespread and immediate. Bonds of that community are immediately subject to depreciation and suspicion because, in the outside world, there is a cause for doubt as to the fairness of its citizens. New capital in any line of industry hesitates to seek investment in that locality, going to communities more progressive whose citizens have more carefully guarded their reputation for fair dealing.

Property values are largely dependent upon improvements. A community without sufficient utility service is bound to decay and, unless relief is given, hundreds of American cities and towns stand to be deprived of the agencies which have contributed most to their development. These facts vitally affect the interests of the contractor and dealer, whose duty it should be, in self preservation, to openly oppose any tendency to place utilities at the mercy of petty politicians and other sinister influences.

WILL DEVELOP PORTUGAL'S WATER-POWER RESOURCES.

A commission has been appointed by the Portuguese minister of commerce to study the matter of the utilization of the water power of the rivers of Portugal for the purpose of furnishing hydroelectric power for railway, power and lighting purposes. Two engineers, Fernando de Souza and Vicente Ribeiro, have been nominated by the representatives of the Portuguese national railways to sit with this committee. In the case of the Portuguese rivers it would be necessary to construct an extensive and likewise expensive system of dams, with a view to conserving enough of the water from the winter rainfall to last through the summer.

REFRACTORIES HAVE LONG LIFE IN ROTATING FURNACE.

Careful Construction and Use of Correct Principles of Design Result in Exceptional Records.

It is well known that the life of refractories has had a great deal to do with the success or failure of electric melting furnaces. A careful study of the reasons why some of the earlier types of equipment have not met with large success will disclose that this has been due to the difficulties experienced in getting roofs and side walls to stand up. This condition has also, in many cases, limited the size of furnace which could be built. There has been much interest for many years in the possibility of developing a type of electric-arc furnace which would show an improved life of refractories, and surprisingly good results have been secured on a two-phase, three-electrode, bottom-conducting type of arc furnace. Recent records from a three-ton furnace of this type give an average of 125 heats per roof and 275 heats per lining, while the bottom has stood up for over a year without replacement. Some roofs have lasted for over 250 heats and linings have lasted as long as 475 heats. The refractories used have been a good grade of silica brick for the roof and a portion of the side walls, the balance of the lining being rammed-in ganister.

No stationary type of furnace seems to have the same opportunity of securing long life from refractories as where the body of the furnace is in motion during some portion of the melting period. Obviously, the best results can be obtained from a furnace in which all parts of the lining are subjected evenly to the same temperature as far as practical, and this result can be further improved if the entire lining is washed by the hot liquid bath of metal, thus aiding in cooling the refractories and securing an even wear.

Fire Clay Makes Good Lining.

In the past year and a half adequate records have been secured from a rotating-drum type, single-phase arc furnace, used principally for the melting of nonferrous metals, to show an exceptional life of refractories. The construction of this furnace, being almost like a barrel, permits the removal of the two flat heads of the cylinder so that in lining the drum the best possible conditions are available. In practice the plan has been to lift the furnace shell off of the rollers upon which it rests, place it on one end, remove the flat end which is on top and lower the lining into the shell piece by piece. While 500 or 600 heats have been secured from linings made up from arched clay brick, the standard type of linings used has consisted of only three or four pieces, viz., a large cylindrical tile for the body of the shell and two circular flat end bricks for the ends. After these have been put in place loose heat-insulating material is tamped in hard between the brick and the steel shell, and after the top end brick is in place the steel and plate is again bolted onto the shell. The bricks described were made of a good grade of fire clay, and, due to the absence of joints and the rotation of the furnace, as pointed out above, records were made of 900 to 1000 heats from a lining. The pouring temperature in most cases will run in the neighborhood of 2100 to 2200 deg. F., although many heats have been made on high-temperature alloys where the temperature has averaged 3000 deg. F. The material used for lining is only fire clay and not silica or magnesite.

Experience with this type of furnace bears out the idea that where the construction of the equipment permits the washing of the complete lining with the liquid bath the best possible life of refractories can be secured. It also demonstrates that it is practical to use the ordinary class of material and secure exceptionally long life of refractories.

GENERAL CONTRACTORS TO MEET IN NEW ORLEANS.

W. A. Rogers, president of the Associated General Contractors of America, has announced that the second national conference of the organization will be held at the Grunewald Hotel, New Orleans, La., Jan. 25-27.

Manual Controllers for Direct-Current Motors

Fifth of a Series of Articles on Principles and Application of Motor-Control Apparatus—"Starting Boxes"—Sliding-Contact Controllers—Development of Multiple-Lever and Drum Types

By G. J. KIRKGASSER and E. W. SEEGER

Development of the "Starting Box."—One of the most important problems in connection with the operation of direct-current motors was the development of apparatus for starting them under load. The hand-operated "starting box" was first devised. It was similar to the present types, except no provision was made for automatically returning the lever to the "starting" position in case of interruption of the power supply. This was a serious defect, and frequently a motor armature would be subjected to excessive current as a result of the power circuit being re-established with the lever in the "on" position and no starting resistance in circuit. To avoid this difficulty it was necessary for an operator to move the lever back to the "off" position each time the power circuit failed.

The next development was the automatic release, consisting of a coil of wire, or solenoid, which holds a "keeper" on the lever against the solenoid armature when the lever is in the "on" position. Acting against this solenoid is a spring which returns the lever to the "off" position when the power supply fails, due to blowing of a fuse, opening of the knife switch in the motor circuit, or when line trouble occurs.

Sliding-Contact Controllers.—As shown in the diagram of connections, Fig. 22, the no-voltage release coil *C* becomes energized as soon as the lever of the starter is moved to the first contact, and it remains energized as long as the power supply exists. The coil is usually connected in series with the shunt field, and is therefore not affected by varying armature current caused by changes in the load carried by the motor. If the power supply fails, the coil is de-energized, and the spring at the hub of the lever throws the latter back to the "off" position against a rubber-covered bumper post. The motor then has the original protection from excessive starting current.

The spring also prevents the lever being left at some intermediate point between the "off" and "on" positions, and this avoids possible damage to sections of the resistor which might otherwise be left in circuit for periods much in excess of the few seconds for which starting resistors are designed.

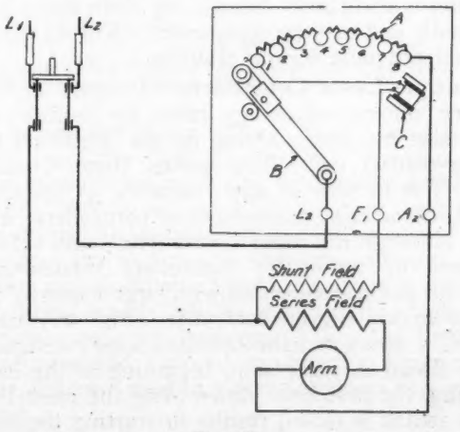


Fig. 22.

Diagram of connections for hand-operated sliding-contact starting controller. "A" is the resistance mounted back of the slate front, "B" is the pivoted arm, and "C" is the no-voltage release coil. The motor is of the compound type.

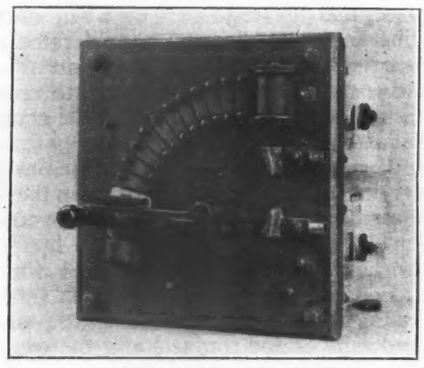


Fig. 23.

A hand-operated starting controller with contact segments in place of the small buttons. This type in use in connection with motors of 10 to 15 hp. or larger.

The no-voltage release also operates to stop the motor if the supply voltage drops to a low value for a long period. However, for brief variations in the voltage the release coil will hold the lever in the "on" position, since the shunt-field current varies but slightly under such conditions and the magnetism is sufficient to hold the lever, thus keeping the motor in operation.

The no-voltage or automatic release being a protective feature, some form of it is embodied in almost all types of controllers.

Standard motor-starting controllers are designed to conform to the standardization rules adopted by the American Institute of Electrical Engineers, which assume that a motor is to be started, under ordinary operating conditions, in 15 sec., taking not more than 150% of the rated current to start, and that the controller should have sufficient resistor capacity, under these conditions, to enable the motor to be started once every 4 min. for 1 hr.

The usual procedure in operating a starting

controller is to move the lever to the first contact, pause a moment, then move it to the next contact, and so on to the full "on" position, consuming 5 to 10 sec. unless a particularly heavy load is to be started.

In the latter case, because of the heavier duty,

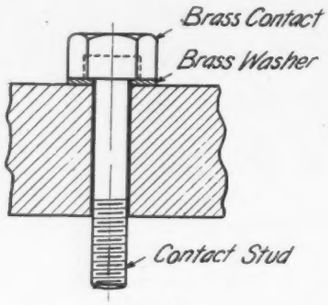


Fig. 24.

Method of securing small contacts to controller faceplate.

a longer starting period is required, and a "heavy duty" type of controller with resistors designed for this service is used. Standard heavy-duty controllers are made for acceleration periods of over 15 sec. and up to 30 sec., or when starting current in excess of 150% of normal rated current is carried for periods of less than 15 sec. Too slow a movement from contact to contact draws arcs which pit the surfaces of the contacts and the sliding shoe of the lever.

Types of controllers having the pivoted arm or lever carrying a shoe which slides over the buttons or segments are known as sliding-contact controllers. For sizes up to about 10 hp. small round or hexagonal buttons are used for the contacts. For larger sizes segments such as those shown in Fig. 23 are employed. Figs. 24 and 25 show the details of the contacts and the methods of securing them to the slate front.

Testing for Controller Troubles.—Since the control of direct-current motors is based on the broad principle of cutting resistance in and out of the armature and field circuits, a short discussion of a few difficulties encountered in the operation of motors and controllers will suffice to suggest ways of investigating and correcting such troubles.

If a direct-current motor does not begin to rotate when the lever of a starting controller or speed regulator is moved to the first contact, or when the first finger or first magnetic switch of an automatic controller closes, the connections should first be inspected. These include line,

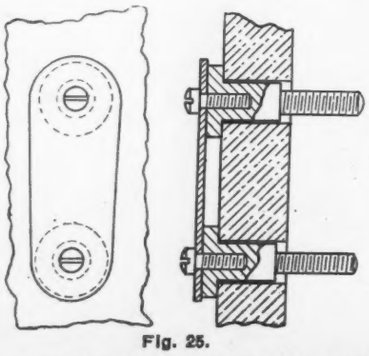


Fig. 25.

Method of securing larger segments to faceplates of standard hand-operated controllers.

motor and controller as well as the connections of the resistors to the contact segments.

On the usual small hand controller, the first segment touched by the sliding arm is connected in the field circuit through the no-voltage release coil. This at once establishes the field flux upon which, with the ampere-turns of the armature, the torque depends.

To test for establishment of field flux, the starting lever should be moved to the first contact, and then a comparatively small piece of iron or steel should be held near one of the motor field poles. If it is not strongly attracted to the pole then the field is not established and there is something wrong with the main circuit or with the connections to the first contact of the controller.

If after the motor has started and the lever is moved over several contacts the speed of the motor decreases, and then as the lever continues to be moved the speed increases, it indicates that some of the connections to intermediate contacts are broken or the resistors are otherwise out of circuit. This should be corrected to prevent the uneven acceleration of the motor to full speed.

No controller should be allowed to remain in use for any length of time unless operating in

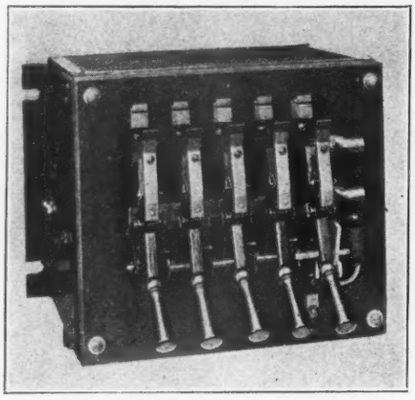


Fig. 26.

Multiple-lever hand-operated controller made by Cutler-Hammer Manufacturing Co.

the manner for which it was designed. Overloading roughens and wears the contacts. To keep all contacts in good condition periodical inspection is necessary. Smoothing them down occasionally and making replacements will do much to eliminate more serious troubles.

Multiple-Lever Controllers.—Because of the greater amount of energy taken by motors of large size too much arcing on the segments of sliding-contact controllers makes them unsuitable. For motors of approximately 35 hp. and larger capacities, multiple-lever controllers are used, although the many conveniences and safety features of automatic controllers recommend them for use in connection with large motors.

The multiple-lever controller (Fig. 26) consists of a series of hand-operated levers designed to be closed in succession, beginning at the left. Pressing the first lever down after the main-line knife switch is closed results in starting the motor with external resistance in circuit. Successive steps of resistance are cut out of circuit as suceeding levers are pressed down, until with the last lever closed all resistance is shunted

out of circuit, and the levers all held in the closed position by a latch which is tripped by a no-voltage release in case of interruption of the power supply or a continued drop in the voltage of this supply. All levers are thrown out by the

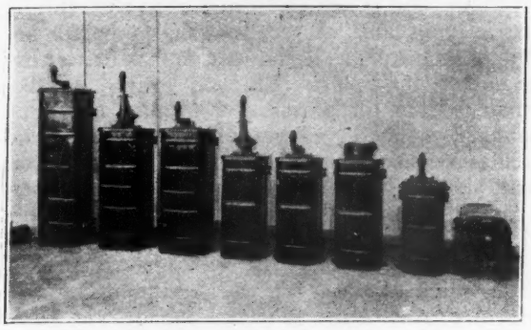


Fig. 27.

Drum-type starting controllers of various styles and sizes.

action of the no-voltage release and can only be closed in rotation again.

Because of the time interval introduced by the interlocking lever design, multiple-lever controllers are often recommended for use with small motors, especially where the service is particularly heavy or where employes may carelessly have the habit of jamming the single lever of a sliding-contact controller over to the "on" position with one sweep.

Drum-Type Starting Controllers.—Another type of direct-current manual controller is operated by a lever located at the top of a revolving drum (Fig. 27) which carries segments making contact with fingers mounted on a stationary shaft. Accelerating points are indicated by

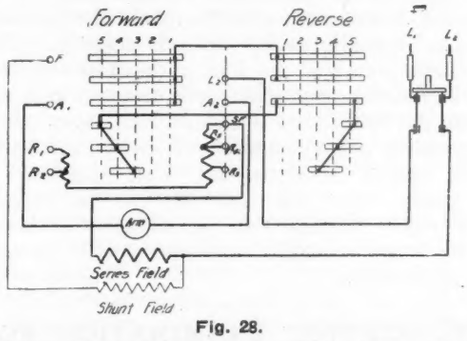


Fig. 28.

Diagram of connections for a reversible-type drum controller with a compound motor.

notches on the upper cover. As the lever is rotated from the "off" to the "on" position, various contacts are made and broken inside the inclosure, cutting out steps of armature resistance during the accelerating period. An arc shield separates the fingers and prevents injury due to arcing and flashing. Leads are brought out to resistors (usually of the grid type) which are mounted wherever convenient. Because of their ruggedness and inclosed construction drum-type controllers are used in industrial plants to a great extent.

A diagram of connections for a drum-type controller designed to start a motor in forward or reverse direction is shown in Fig. 28. When the operating lever is moved in one direction to the

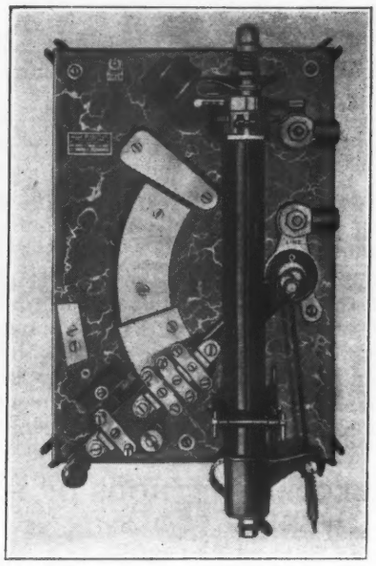


Fig. 29.

Allen-Bradley hand-operated controller with compression-type resistor.

first point, energy passes through the steps of resistance to *SF*, and through the series field at the same time that the shunt field is energized. At the second point the segment on the drum makes contact with finger *R2*, cutting out the first resistance step. The second, third and fourth steps are cut out similarly. In the reverse direction the same resistors are used, but the connections to the motor armature are reversed. The theory of acceleration is the same as that in connection with the starting controllers previously described.

Instead of horizontal rotation of the lever, drum-type controllers are sometimes equipped with a lever which is moved forward and backward in a vertical plane, the drum being rotated by means of a gear and pinion. Further reference to drum-type starting controllers will be made later.

Controllers with Compression-Type Resistors.—Controllers of the graphite-pile type have a resistor made up of a pile or stack of graphite discs, the combined resistance of which varies with the pressure. The pressure on the pile is slight at starting, the resistance being great

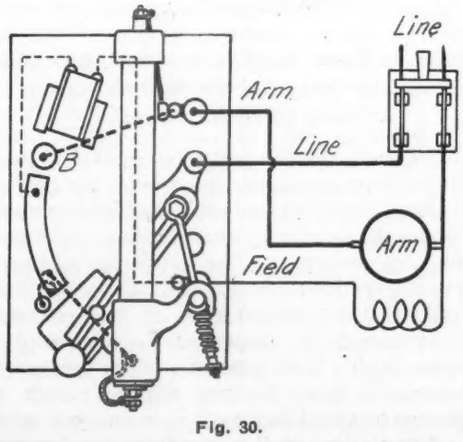


Fig. 30.

Diagram of connections for compression-type resistor and starting controller.

enough to keep the initial current at a small value. The pressure is gradually exerted and the resistance decreased as the lever is moved and the motor brought up to full speed.

One type of direct-current motor controller in which the graphite-compression resistor is used is shown in Fig. 29. As the lever is moved up from the lower position it compresses the graphite discs in the tube located on the front of the panel, gradually reducing the resistance. At the extreme upward position the lever is held by the no-voltage release coil with all external resistance out of the armature circuit. Fig. 30 shows how the energy flows directly to the motor with no resistance in circuit when the operating lever is in the position corresponding to the segment *B*.

(To Be Continued.)

NEW ELECTRIC METHODS OF HARDENING TOOLS.

A method of hardening tools which seems to possess practical value has come into extended use in Germany. In the process of electrolysis the hydrogen generated at the cathode is heated to such an extent that the cathode itself is brought to a red heat. Advantage is taken of this phenomenon by using tools that are to be hardened as the cathode. It is however necessary to protect the cutting edges of the tools, as these are liable to be raised to excessive temperatures. Methods of obviating this are protected by recent patents. The cutting edges are covered with a layer of nonfusible conducting material, the thickness of this coating being so chosen that the edges are protected during the heating of the body of the tool; after the coating is flaked off the edges are exposed for the final heating. If the parts are only to be heated for subsequent hardening, the edges may be covered with graphite cement, so that the glowing tools may absorb carbon. Another method of protection consists in lowering the tool into coarse powder or sand, lying at the bottom of the bath, or the edges that are to be hardened may be protected from the influence of the current by covering the parts to be hardened with suitably shaped porcelain tubes, which are removed when the body of the tool is raised to the required temperature.

NEW USE FOR MAGNETIC CLUTCH IN STEEL MILL.

Reciprocating Pump and Synchronous Motor Connected by Means of Spring-Steel Clutch Actuated by Direct Current.

Synchronous motors are now used by many steel mills, foundries and iron works for driving pumps, fans, compressors and other loads requiring a constant speed and necessitating infrequent starting and stopping. The synchronous motor is particularly desirable for this class of work as it allows the power-factor of the electrical supply system to be improved by over-exciting the motor field. This type of motor, because of its extremely low starting torque, must be brought up to speed before it is connected to the load. After the motor reaches synchronous speed, a clutch between the motor and the load is engaged thus bringing the pump or fan up to speed.

An electric-clutch equipment of this type has recently been installed in the Petroleum Iron Works, Sharon, Pa. The motor is rated at 150 hp., and is served from a 2200-volt, three-phase supply line. A reciprocating pump for an accumulator comprises the load and is driven by the motor through a reduction gear. On the armature shaft of the motor is installed a Cutler-Hammer magnetic clutch which consists of a circular armature member and a field member, a small air gap separating the two. Each member is carried on a spring-steel plate which holds the friction faces out of engagement until the clutch is magnetized. Upon the passage of current through the winding of the field member the armature is attracted to it and engages the friction surfaces. This is accomplished through the flexibility of the spring-steel plates, there being no sliding of the clutch parts along the shaft to make or break connections.

The clutch used in this installation is 30 ins. in diameter and has a maximum torque of 2410 lb. at 1 ft. radius. It was made by The Cutler-Hammer Manufacturing Co. of Milwaukee. The energizing current required for the clutch is so small that it may be taken from the exciter of the motor or from any other direct current source.

CALIFORNIA COMMISSION'S REPORT ON UTILITY SERVICE.

In an official report to the government the California Railroad Commission makes the statement that rates for public utility service are nearer to pre-war days than any other commodity. It is pointed out that other commodities have increased from 100 to 500%, while the average increase in public utility rates is 20.77%. The report mentions that any halt in the state's hydro-electric development will spell disaster and expresses the belief that sound utilities functioning economically and efficiently will carry the burden of the state's development. The statement is also made that "this measure can be accomplished only through fair distribution of costs, fair treatment of utility consumers, utility owner and utility labor."

CIVIL SERVICE EXAMINATION FOR RADIO ENGINEERS.

Open competitive examinations for radio engineer, assistant radio engineer and radio laboratory assistant have been announced by the United States Civil Service Commission, applications to close April 5. The duties of the radio and assistant radio engineer will be to conduct or superintend the development, design and construction of practical and special apparatus and methods of radio signaling suited to special conditions and of standardizing such apparatus for the Signal Corps. The duties of the radio laboratory assistant will be to assist in radio work to be conducted in Signal Corps laboratories. Those desiring to make application should write to the commission, Washington, D. C., asking for form 2118 and mentioning the title of the examination desired.

Progress in Standardization of Plugs and Receptacles

Elimination of Stumbling Blocks to Standardization Which Retard Electrical Progress Being Sought Through Co-operation of Contractor-Dealers—Seek Adoption of Separable Plug

By W. D. YATES
General Electric Co.

After hearing this paper and the discussion which followed its presentation, the Indiana State Association of Electrical Contractors and Dealers adopted a resolution pledging the members to take immediate steps toward the standardization of plugs, receptacles and attachments on electrical appliances. Electrical contractors of that state promise to install only standard plugs, receptacles and attachments in new work, and to urge their installation at every opportunity in old work during repairs, extensions or the connecting of appliances.—EDITOR'S NOTE.

Standardization in its broadest sense is of such magnitude and comprehensiveness that it is inseparably woven into all activity which makes for progress. In fact, the statement has been made that "the degree of standardization in any country is a measure of its civilization, at least so far as its material and industrial progress is concerned."

Have people ever stopped to consider that a common language is nothing more or less than the standardization of the meanings of words? What endless trouble and confusion would prevail if the country did not have a standard system of weights and measures and a standard system of coinage.

Of course, standardization has already extended far beyond these fundamentals and is constantly growing. It is right and proper that it should grow, because it certainly serves the general economic good.

The advantages of standardization are fairly obvious. Among other things, it allows the accumulation of sufficient supplies and parts with which to make repairs, and allows such accumulation to be made at a considerable reduction of total investment. It enables the buyer to take advantage of quantity purchases; it serves to eliminate error in the filling of orders; it acts to reduce the cost of keeping a correct inventory of stock, and it makes for efficient commercial relations, prompt deliveries and reasonable prices.

These are a few of the arguments in favor of standardization.

STUMBLING BLOCKS TO STANDARDIZATION.

What are the arguments against it? Only one, and that is (particularly in the case of standardization of type and dimensions) the possible danger that standardization may act as a brake on progress. The answer to this sole negative argument, the remedy for this one possible ill lies in keeping standards abreast with progress, and certainly it is easier to improve and to bring up to date a limited number of standards than to change an unlimited number of widely varying types.

Three things have always tended to block the rapid advance of standardization: (1) The fear that standardization on some given type or types might be detrimental to some particular industry; (2) the fact that people in general differ so widely in their mental attitudes and viewpoints, and (3) the natural human reluctance to sacrifice personal advantage for the common good.

These negative influences are rapidly overcome, the first—this bugaboo of retarded development—by the established fact that 80% of past efforts to standardize have stood the test of time and the 20% of failures was due to hasty and ill-judged choice of standards; the second—the wide diversity of opinion—by co-operative effort through associations, etc., and the third—natural human selfishness—by the more and more common acceptance of the theory that the best way to acquire personal or corporate success is to do something for the good of all.

Now, while standardization is so broad in scope as to be practically unlimited in its application, when anyone speaks of standardization they usually refer to some particular phase or special application of the general term.

Contractor-dealers are naturally most interested in standardization as applied to the electrical industry. In fact, as members of an association of the contractors and dealers, they meet for the sole purpose of standardizing.

ASSOCIATION BASIS OF STANDARDIZATION.

They assemble to exchange ideas on various ways of doing a wiring job—that they may standardize on the best way. They meet to exchange improved methods of running an electric store in order that they may standardize on the best methods.

All of this association work is really for the purpose of standardizing on those basic principles which will enable members to function most efficiently—to serve the public best. The term "standardization" covers a wide field.

In the standardizing of electrical products much has been done and much remains to be done. Before the era of electric light, and predicating the later struggle to standardize electrical appliances, there was waged a long, weary war for the standardization of candles and candlesticks. At that time there was a rather excusable demand on the part of the general public that candles "as bought" should fit into the candle-

sticks "as possessed." The manufacturers of candles and candlesticks naturally claimed that the public was unreasonable, but in the end the public won—as the public has a way of doing in the long run.

When electricity came to be commonly used for lighting, new and different types of lamps were developed, and, of course, sockets and receptacles with corresponding shells were designed to take these lamps.

Seek Standard Plugs and Receptacles.

The National Lamp Works at Cleveland has a collection of the different lamps that were manufactured in the United States previous to the adoption of the present standard form. The collection contains 179 different bases. Wasn't that wonderful material for the merchandising mess? Could one imagine a worse condition either from the standpoint of the man who sold lamps or the man who bought them? Is it any wonder electric lighting was not universally adopted over night? And yet, let us of this day and age not be too contemptuous, for we are allowing conditions almost as bad to exist in the industry.

Those 179 different bases evolved into six, (early in 1900 the double standard of Edison and Thomson-Houston was dropped), and today dealers have to stock and furnish lamps with only flashlight, miniature, automobile, candelabra, medium and mogul bases, which all of the lamp factories in the United States make interchangeable.

About 12 or 15 years ago standard dimensions of inclosed fuses and inclosed-fuse cutouts were adopted. Previous to the establishment of standard fuse and cutout dimensions every manufacturer of fuses and cutouts made a different fuse and cutout, none of which were interchangeable. Who suffered from the resulting chaos? The manufacturer, the seller and the buyer of fuses and cutouts.

Coincident with the standardization of fuse dimensions came the standardization of knife switches. This was a necessary development, of course, as many knife switches were fused. However, a good job was made better and standard knife-switch capacities were adopted.

Quite recently manufacturers of outlet boxes and covers have adopted a standard system of catalog numbers which has greatly simplified the specifying and handling of this material.

Electrical Progress Retarded by Lack of Standardization.

What of the jobs which remain for the industry to do? For the immediate present there are three which merely have to be completed. They have alrady been started and much good work has already been done on all three. First comes the nation-wide adoption of 110 volts and 60 cycles as a standard voltage and frequency. The general acceptance of this standard would save thousands of dollars now invested in duplicate stocks and materially increase the sale and use of electric appliances of all kinds. There is a city in New York state which boasts of two competing central-station companies, and which is served with both alternating and direct current. It is a factory town, many people live in rented apartments and as they move frequently they naturally hesitate to invest in electric appliances because they have learned by sad experience that their a-c. or d-c. device may become inoperative the first time they move. Needless to say, this is a poor town in which to sell electric appliances, and incidentally only 10% of the homes are wired. That is an instance of the way in which electrical progress can be retarded by lack of standardization.

Another problem is to secure the adoption of some standard easy method of hanging fixtures. Nothing could do more to stimulate the sale of lighting fixtures of all kinds than some simple method of putting them up and taking them down. All over this fair land millions of people are living in rented apartments and 99% of these people are dissatisfied with their lighting fixtures, but they refuse to put good money into fixtures to be installed on another man's property. So they permit inefficient, inartistic fixtures to hang from their ceilings. If they could plug in new fixtures and as easily disconnect them when they moved they would buy fixtures—expensive fixtures—for use in rented apartments.

Furthermore, it isn't the lighting fixtures alone that are involved. People with permanent fixtures which are eyesores hesitate to buy decorative floor and table lamps, feeling that any attempt at electrical decorative effect will be counteracted by those already installed.

The third job to be completed is the standardization of attachment plugs and receptacles. There are 37 different types of plugs in use today, none of which are interchangeable—not much better than the old lamp-base situation. And the sooner this condition is remedied the better it will be for the industry as a whole.

There is nothing that any or all of these 37 varieties of plugs can do which cannot be done just as efficiently by the standard separable plug with ¼-in. blades spaced ½-in. apart. The weight of argument is all in favor of the separable type of plug.

More and more appliance manufacturers are adopting this standard type of plug—the sole objection which the appliance manufacturer has against the standard plug is the matter of price, etc. The electrical press is committed to these standardization movements. The electric trade papers are doing wonderful work, and the feeling of the general public on the subject is reflected in numerous articles in the popular magazines, all making strong pleas for electrical standardization. Contractors and dealers can help immeasureably by refusing, for example, to sell stock or install other than standard plugs and receptacles. And in doing so they will not be pulling chestnuts out of the fire for any one manufacturer. Eight of the largest competing wiring-device manufacturers are now making this standard type of plug.

We are entering into a period of unprecedented electrical development. The public is awakening to the possibilities of electricity and electric appliances. Added to the stupendous total are the homes which, though wired for electricity, are not adequately wired—homes which do not have sufficient outlets to permit of the convenient use of electric appliances. The wiring of these homes must eventually be brought up to date.

Importance of Merchandising to Electrical Industry

Need for Improved Methods of Distributing Electrical Appliances and Labor-Saving Devices Pointed Out in Address Before Convention of Electrical Supply Jobbers Association

By M. C. TURPIN

Publicity Manager, Westinghouse Merchandising Bureau.

What is merchandising? We hear a great deal these days about merchandising, but do we have it clearly fixed in our minds as to just what it means. Various definitions of the term have been given. "Bill" Goodwin—and he surely ought to know—says: "Merchandising is the conception on the part of the manufacturer of a product which he can produce and sell in reasonably large quantities to the ultimate consumer at a profit, taking into account, of course, all the factors of distribution including transportation, taxes, advertising and the recognized channels of the jobber and retailer." A definition that I like to use is called the six P's: "The Power to Persuade Plenty of People to Purchase at a Profit." However, in the final analysis, merchandising is simply creating and supplying a demand, though this naturally includes a good many factors.

M. C. Turpin.

Merchandising is of primary importance in any commercial operation having distribution as its object, whether the products be those of mine, field, ocean or forest, and they are all favorably influenced by an intelligent application of its fundamental principles.

Distribution of Electrical Devices Formerly Neglected by Manufacturers.

The manufacturers of electrical apparatus were until a few years ago largely concerned with the production of larger and more technical apparatus which was generally sold direct to the user. For this reason they have been much more interested in engineering than in merchandising. They thought, talked and dreamed of volts, amperes, power-factors and efficiencies instead of the service that would be performed by electrical apparatus, and as a result the mind of the public has become befuddled, and electricity has become and still remains largely a thing of mystery. The problem of distribution through the recognized channels of the jobber and retailer were of small significance to the electrical manufacturer. The distribution of electrical appliances for many years was left largely in the hands of central-station companies which, with the one thought in mind of building up their loads, have frequently sold these appliances in a manner, to say the least, that was not consistent with the building up of staple merchandising lines. The situation, however, has radically changed. There has arisen an enormous demand for electrical appliances for household users on the part of the general public, which has begun to realize the economy and convenience afforded by their use. One of the rather disconcerting effects of the war was the almost total disappearance of domestic servants. This threw a heavy burden on the housekeepers, and they promptly turned to electrical apparatus for assistance. Consequently, the demand for domestic electrical devices, such as flatirons, grills, percolators, ranges, washing machines, ironing machines, vacuum cleaners, dishwashers, and, more recently, refrigerating machines, has increased a thousand fold. At the same time the owners of unwired houses immediately wanted electric service, and thus was created a large market for wiring supplies of every description.

Modern methods having thus been thrust upon the housekeeper, it is not to be supposed for a minute that she will ever go back to the antiquated housekeeping methods of earlier days, especially since the servant of the future will insist upon being supplied with various forms of labor-saving appliances.

Household Applications of Electricity Overlooked by Electrical Engineer.

It is an interesting commentary upon the work of the electrical engineer, that, unlike charity, he did not begin at home, but for many years devoted his attention to increasing the efficiency of the office, shop and factory, entirely neglecting the home.

Meanwhile the housewife sweated over the coal stove, and wore herself out with the old-fashioned broom and washboard, and we may rest assured that now that woman has obtained the vote and other prerogatives that formerly belonged to mere man, she will never rest content until the home is as efficiently and economically operated as the modern mill or factory.

There is, therefore, a big job ahead of us, and

one which presents many problems that may cause us sleepless nights if we are to effect a correct solution. The figures given by H. B. Kirkland at the Baltimore convention of the National Association of Electrical Contractors and Dealers show what a field of prospective business lies before us during the coming year. It is now known as the $2,000,000,000 industry. In connection with these figures it is well to remember that there are approximately 21,000,000 homes in the United States, only one-third of which are wired for electric service. Of the 14,000,000 unwired houses, approximately 5,000,000 are within the reach of central-station lines. Assuming that each of these homes is a prospective purchaser of $750 worth of electrical material, it can be appreciated what an attractive volume of business looms up ahead.

According to recent estimates there will be spent during 1921 the tidy sum of $245,000,000 for lighting fixtures, shades and reflectors, and who can say what it will amount to in the next few years. The large proportion of this business must pass through the hands of electrical jobbers, of whom there are only about 500 in the United States. These figures might be continued indefinitely, but I think we will agree as to the volume of business ahead, though we may not always agree as to the best methods to be pursued in securing it.

Merchandising Problems Confront the Electrical Industry.

The electrical industry is entirely unlike any other trades, such as hardware, dry goods, boots and shoes, which secure their distribution through merchants who represent the last word in modern methods of merchandising. The manufacturers of such commodities are not required to know anything of the subject of retailing. With the electrical trade it is different; the sale is not completed when the device or appliance passes into the hands of the user. It must not only please the customer in appearance but it must perform day after day and month after month, the task for which it is designed to the entire satisfaction of the most discriminating purchaser.

The future of our business demands the development—and the prompt development—of the electrical retailer for the distribution of electrical appliances, simultaneously with the education of the user, causing them both to awake to a realization of the fact that neither the homes or the offices of today are properly equipped to take advantage of the many labor-saving electrical appliances that are on the market.

The problem is a far harder one for us than for other kinds of merchandisers. For example, there are, according to the merchandising department of the New York *World*, in New York City alone 2500 drug stores and 15,000 grocery stores ready today to distribute any and all toilet articles and food products that any one may care to manufacture and advertise.

In contrast, have we made it easy for the woman—and she is generally the one we have to sell—to purchase electrical goods?

Almost everyone in the electrical industry is familiar with the evolution of the present-day contractor-dealer from the wireman who sensed a profit in the sale of the apparatus he was installing. He purchased a few appliances, put them on the shelf along with his wire and cleats, and then behold, he became a merchant without any knowledge of the fundamental principles of merchandising. Is it any wonder, then, that of the 3000 to 4000 so-called electrical contractor-dealers who start in business every year 97% fail? This is the man that the jobbers and the manufacturers must educate and develop into an electrical merchant who will provide a permanent channel of distribution.

There is no question but what the scheme of distribution that has been adopted is the correct one; that is, from manufacturer to jobber to retailer to consumer; but its success depends entirely on the close co-operation of the manufacturer, jobber and retailer—the indispensable triangle, each leg of which has its own well-defined functions.

Function of Manufacturer in Distribution of Electrical Goods.

In the electrical trade the tendency is to leave the distribution of merchandising lines entirely to the jobber and the retailer, but this involves the active supervision by the manufacturer of the methods used to secure a better and more permanent distribution. While fully recognizing the functions of the jobber and the retailer, the manufacturer does not feel that his responsibility has been lessened, and he is today spending a great deal of time and money in a well-organized effort to improve and perfect merchandising methods used in the sale of electrical appliances.

The efforts being made by the companies with which I am connected to accomplish this purpose consist in the organization and distribution throughout the country in various cities of what have been designated as "Better Merchandising Shows." The properties comprising these shows consist of some 20 wall panels illustrating by short sentences, easily read and digested charts and photographs, a number of fundamental principles; actual table and counter displays of electrical goods; two "dummy" window displays showing good and bad methods of trimming and illuminating; and other helps toward making the dealer a better merchant. The show is taken to a city in which is located a distributor and local office of the manufacturer, and is installed in two or more rooms of a centrally located hotel. A hotel is chosen in order to remove any hesitancy a dealer might have in visiting the establishment of a concern with which he is competitive or not on the best of terms, whereas he would not feel any hesitancy in visiting the show in a hotel room.

Details of Instruction Given to Dealers by Specialists.

The first day is devoted to the instruction of the jobber and office salesmen, at which time meetings are held and sales talks are given by specialists from the factories where the different appliances are made, or, in their absence, by others who are qualified to talk.

Specialists from the merchandising bureau accompany the show, set it up and demonstrate it both to the jobbers and to the dealers, a demonstration for the latter being given two or three days as may be required. A series of invitation

letters is sent out several weeks in advance to all the dealers in the territory and to any others who may be interested. The show is open to any one interested in better methods of merchandising.

Arriving at the show, the dealers are taken through by the specialists in groups of from two to five (not over six) and are instructed in the principles of better merchandising. They are invited to ask questions and thoroughly discuss any of the points brought out in the talk. The possibilities in the way of future sales in the electrical business are pointed out, definite suggestions are given in subjects such as methods of accounting, store management, time payments, store and counter arrangement, window trimming, and advertising, both national and local, and showing him how he can cash in on the manufacturers' national advertising. The visitor is in the same manner initiated in the process of the manufacture of incandescent lamps and appliances, and is given a complete and comprehensive idea of the methods which have enabled many contractors to become successful electrical dealers.

A pamphlet entitled "Better Merchandising" embodying practically all of the information given orally by the lectures is presented to each dealer so that he may have with him a memorandum of those ideas he may desire to put into practice.

After the first dealers' show has been given the properties are turned over to the local district office and the jobber in that particular center, who will take up the work from this point and carry it to various dealer centers in the surrounding territory. The bureau specialists then go to another city with a new set of properties, and the same procedure is followed. The dealer centers will be chosen with respect to geographical location, train service, local buying tendencies and other determining factors.

The entire success of the idea conveyed in the "Better Merchandising Shows" is dependent upon the follow-up work which is done by the jobber in getting the dealer to put into practice the principles which have been explained to him.

Results obtained in those centers where the shows have been exhibited and then followed up aggressively by the jobber have been highly gratifying. In some communities the sales of certain dealers have averaged several hundred per cent over a similar period before the show was exhibited, proving conclusively that there is actually a dollar-and-cents return in following out the principles of better merchandising.

Jobbers Play Important Part in Distribution of Appliances.

Now that we have passed from a buyers' to a sellers' market, there is a tendency on the part of us all to fear that a reduction in the volume of sales will increase overheads and decrease profits and tie up capital in slow-moving merchandise. Naturally the best way to dispel this fear will be to use every legitimate and sensible way to keep up sales. In our business this is possible, for there exists the very best of reasons why the use of electrical apparatus will save the purchaser money.

As his part in the campaign the jobber can help maintain sales by the use of intelligent effort, carefully supervising and drilling his sales force. The past few years have "ruined us." We are so accustomed to having orders forced on us, that we have almost forgotten how to sell, and every sales force needs a tonic and most of them a purgative.

The jobber should give good service, letting nothing interfere with prompt and perfect filling of any order or request of a customer.

Bearing in mind the thought that the responsibility for educating the retailer lies largely with jobbers, it seems quite evident that they should —if they have not already—establish merchandising departments which will be capable of carrying on this work. The work of merchandising is being thrust upon the jobbers and they must prepare for it.

The central-station companies are now handling merchandising, many of them on a large scale, but it is safe to say they will not continue to do so when the electrical retailer has been educated up to a point where they can safely turn over this business to him. It is the jobber's duty to do this work of education, and it is perhaps true that the average jobber's salesman is not able with all of his other work to take on this extra burden and make a success of it. If it is not possible for the jobber to organize a merchandising department, it is urged that he should at least secure a sales promotion and advertising man who would be able to accomplish some of the tasks that would naturally fall to the lot of the merchandising department.

One of the particular duties of the sales promotion man would be to compile and keep up to date a suitable mailing list of dealers who should be circularized at frequent intervals. This list should preferably be classified according to the standing of the dealer, the goods he handles, whether he is a live, up-to-date merchant or otherwise. A mailing list is a valuable asset in merchandising, but is not worth the space it occupies unless it is continually revised and the "dead wood" removed—nor can this work be left to the office boy.

Another suggestion is that jobbers analyze carefully each line sold, and that sales arguments be prepared which will prove that the use of electrical apparatus will save time and money for the ultimate buyer. The jobber's salesmen should be on intimate terms with all of the apparatus they sell and its talking points, so that they can, with perfect confidence, tell of its merits to the dealer. They should not be in the position of the salesman who was demonstrating a vacuum cleaner and became confused over some detail about which he had been asked, guessed wrongly at the answer, and was set right much to his embarrassment by a lady customer who overheard him. Nor should he go to the other extreme, like a central-station salesman who demonstrated heating appliances to a lot of dealer clerks, many of whom were girls, and he talked for 30 minutes on how to find the number of joules and calories required by a coffee percolator.

Salesmen should know other uses than regulation ones to which apparatus may be put; particularly does this apply to fans. It does not require any sales ability to sell fans in the hot

summer, but it does in the winter. Therefore, the dealer should be given some ammunition—he should be told how fans are used to help the furnace draft, to assist the radiator, to dry fruit, to dry women's white shoes when they are cleaned, to dry photographic negatives, to keep frost off the windows, and so on.

Good ideas on merchandising and salesmanship are being published continually in the trade papers, and no up-to-date business man can afford not to read his trade papers, as they are full of news, good suggestions and ideas that should not be missed. A good plan is to have some bright young fellow or girl who is familiar with the business go through the papers and mark the articles and advertisements or such portions of them as should be brought to attention, using, if desired, different colored pencils to indicate the relative importance of the article. This plan will enable busy executives to get most out of the paper in a minimum amount of time.

In conclusion, it is well to emphasize the fact that if electrical jobbers are going to capitalize on the enthusiasm created by "Bill" Goodwin and "Sam" Chase it will be necessary for them to provide merchandising assistants who will thoroughly educate the electrical dealer, and who will with an enthusiasm born of knowledge and confidence carefully steer him past the rocks of poor business methods and lead him triumphantly into the harbor of better merchandising.

PROGRESS IN ELECTRIFICATION OF ITALIAN RAILWAYS.

Ministry of Public Works to Conduct Experiments with High-Tension Direct-Current and Three-Phase Systems at Industrial Frequencies.

Efforts are being made by the Italian Ministry of Public Works to hasten the practical realization of the extensive plan already approved for the electrification of the railways in that country. While the eventual utilization of the systems employed on the American railways, which are conceded to possess certain evident advantages, is not excluded, it has been decided at first to undertake an extension of the three-phase, 16-cycle system now in use on the lines already electrified, since the adoption of a new system would involve delays. In the meantime, however, experiments on a large scale will be conducted with high-tension direct-current systems and with three-phase systems at industrial frequencies of 50 or 42 cycles. The alternating-current system would permit a considerable saving in power-plant investment by utilizing the kind of energy now produced for industrial purposes.

It is intended that the construction of electric locomotives shall keep pace with the work of electrifying the lines so that these shall be available without delay. Studies are being made with a view to designing new types of locomotives adapted to the two new electric traction systems with which experiments will be conducted. Standard types of overhead equipment have been established, the production of which in accordance with American ideas will be organized. If Italian manufacturers are to supply practically all of the required equipment, a large increase in their productive capacity will be necessary, and preliminary steps have already been taken toward bringing this about.

It is believed that, for the most part, the energy required for the extension of electric traction on the Italian railways can be provided by the power plants already in existence or in course of construction. A few powerful hydroelectric stations will be constructed by the state in certain localities in order to fill in gaps in the existing system and to provide a suitable reserve. However, the interests of the government in stimulating the production of energy will be limited for the most part to the granting of subsidies to private organizations.

ELECTRIC DRILLS USED FOR SHEET-METAL WORK.

In visiting a small sheet-metal factory the use of a portable electric drill doing the work ordinarily assigned to a hand punch was accidentally discovered. Where it was convenient to carry the sheet metal to the drill, a bench drilling stand was used similar to the one shown in the illustration, the drill being a product of

Portable Drill Used in Sheet-Metal Shop.

The Van Dorn Electric Tool Co., Cleveland, O. Where it was more convenient to carry the drill to the work, it was detached from the stand and used like any portable electric drill.

As a portable tool its uses were almost too numerous to mention. Whether for light or heavy-gauge sheet metal, steel or iron castings or wood and wherever holes were needed, a hurry-up call went out for one of these handy tools. It was said that on one occasion a drill had paid for itself in the first week of use. The manufacturer advises that among the unique applications of the drill are suspension on traveling runways and radial arms and both air and hydraulic feed. In one case drills are used for tightening bolts on harvester frames by using a special chuck.

RATE ADVANCES ASKED BY PHILADELPHIA COMPANY.

The Philadelphia Electric Co. has filed a new schedule of rates with the Public Service Commission, asking approval of increased charges to be placed into effect on Jan. 1. Primarily, the advance covers off-peak service to theaters, newspaper establishments, combined urban and interurban railway service, etc., including both retail and wholesale light and power consumers.

EDITORIAL COMMENT

Contractor-Dealers Assist Utilities

When a crisis arises in a country in which the inhabitants are threatened by an external foe, feuds and factions and individual and collective antagonisms are swept aside or forgotten for the time and the entire people unite for defense and self-preservation. The same instinct applies to communities. When someone on the outside belittles or stigmatizes a community the citizens unite against the common enemy with a unanimity which excludes all other considerations.

Such a crisis is said to threaten the electrical industry at the present time. Different branches of this giant industry are being told that the menace of stagnation—even extinction in many of its units—is being projected at the very fountainhead of the industry, the public utilities. The central-station companies of the country are sounding the alarm that public opinion has in some manner been directed against them to such an extent that in many cases the individual companies find themselves unable to dispose of their securities and are without standing when they seek adequate rate increases to care for the increase they must pay for wages and equipment, not to mention materials for extensions.

Contractor-dealers have heard the sounding of this alarm at their association meetings. They naturally have more than a passing interest in a condition which threatens their own business. They realize fully that without the central stations to produce and distribute electricity there would be little use for the electrical contractor and much less use for the electrical appliances, fixtures and equipment which the electrical dealer has to sell.

Whatever antagonism the contractor-dealers have had for the central-station companies, generated perhaps at a time in the past when the latter were compelled to pioneer the introduction of appliances and to maintain their own electricians to protect and extend their service, is fast diffusing into a memory. Now that the central-station companies have come to the contractor-dealers, as man to man, with clear and convincing statements of conditions, even the memory of the old antagonism is being buried.

In Indiana and Tennessee the state associations of contractors and dealers have unanimously adopted resolutions to support the utilities in their efforts to obtain adequate rates and to sell their securities. As pointed out by Morse DellPlain, whose address before the Indiana contractor-dealers appears elsewhere in this issue, the contractors and dealers, who are in most intimate touch with the general public, can accomplish great results in the creation of the sentiment that will induce the public to demand better treatment of public utilities.

Electric Transportation

More than 10,000 motor haulage lines are operating throughout the United States, some of which have invested in them as high as $2,000,000. This fact not only substantiates the promises of the motor truck manufacturers of a few years ago, but proves beyond all dispute that there exists a demand for such a form of transportation. The tremendous growth of this motor trucking business is the more surprising when it is remembered that road building has by no means kept pace with transportation needs.

When the motor trucks first came into the limelight as a really big attempt to alleviate the congestion and breaking-down of our railroads during those days when the demands of war played chaos with our industrial facilities, and the railroads and their termini were recognized as being the neck of the bottle, the electric interurban railroad and the electric storage-battery truck were sponsored in these columns for many tasks that the gasoline trucks are doing so admirably today.

When road building starts again and the hundreds of millions of dollars have been expended for this purpose, automobile taxation will undoubtedly take on some form in which speed and destruction of roads will be factors. When this occurs, the storage-battery truck will have one more advantage over the gasoline truck, to which may be added perhaps lower maintenance charges and lower cost per ton-mile.

The storage-battery truck of today with its battery exchange facilities can meet the needs of the termini, the door-to-door requirements of the jobber and merchant, and the demands of consignor and consignee. In everything except weight, speed and initial cost it is the superior of the gasoline truck when traveling good roads. The central-station companies that want a battery truck load might well look into the question of linking up the city with the suburbs, and the smaller towns with their neighbors where the roads are worthy of the name.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

AMENDMENT TO WATER-POWER BILL VESTS CONTROL IN CONGRESS.

Advices from Washington, D. C., under date of Dec. 16, indicate that the senate committee on commerce ordered a favorable report on the Jones bill, which strikes out "national parks and national monuments" from that provision of the water-power act which permits the commission to consider applications for water-power permits. The effect of the amendment will be to vest in Congress alone the right to determine whether or not the natural resources of the national parks shall be commercialized. President Wilson signed the water-power bill last May on condition that the law should be amended as contemplated by the Jones bill, and the indications are that the new measure will be passed by Congress.

SYMPOSIUM ON ELECTRIC RAILWAY DEVELOPMENT.

Automatic Substation and One-Man Safety Cars Chief Topics of Discussion at Chicago Meeting.

Three papers dealing with present tendencies in electric railway development and available means for improvement were presented at a joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers in Chicago Dec. 17, E. J. Blair presiding. "Economic Aspects of the Light Weight Safety Car" was the title under which papers were presented by H. A. Johnson, organization engineer of the Chicago, North Shore & Milwaukee Railway Co., and H. L. Brown, western editor of *Electric Railway Journal,* the former speaking of the economies effected by the installation of one-man safety street cars in Waukegan, Ill., and the latter giving a comparison of operating records for one-man and two-man cars. Mr. Brown emphasized the savings to be made by reduced platform expense for the one-man car.

In a paper on "Train Operation on Urban Railways," S. B. Way, vice-president and general manager of the Milwaukee Electric Railway & Light Co., gave details of the construction of a two-car, three-truck train of the articulated type used in Milwaukee. This method was the outgrowth of a war-time expedient of using old equipment and has resulted in more adequate facilities for taking care of the peak demands for car capacity without necessitating additional platform expense.

Charles H. Jones, electrical engineer of the Chicago, North Shore & Milwaukee Railway Co., spoke on "Automatic Railway Substations," giving a review of the development of such stations on the lines of his company. Wiring diagrams and methods of operation were also presented.

The papers were discussed by Bion J. Arnold consulting engineer, Chicago, and H. H. Adams, electrical engineer of the Chicago Surface Lines. The former gave the history of the development of the automatic substation for electric interurban lines, and the latter spoke of the application of the one-man safety car to service in large cities.

COAL RECOMMENDATIONS OF SENATE COMMITTEE.

Report to United States Senate Outlines Existing Conditions in Coal Industry and Recommends Regulation by Federal Agency.

The senate committee on production and reconstruction, of which Senator Calder of New York is chairman, has been investigating the coal situation for some time, and in a preliminary report made before the United States Senate the committee recommends the regulation of the coal industry as a means of curing certain evils which it asserts now exist. The following extract is taken from the committee's report.

National development depends upon an ever-increasing supply of power. Heat is as necessary for production, in fact, for human existence, as is air or water; its use must be continued from day to day and cannot be deferred or interrupted. The nation is dependent upon coal as its chief source of heat and power, yet the production and distribution of coal are badly organized and subject to manipulation at the expense of the people. Coal profiteering, especially as it has followed the priority orders issued by the Interstate Commerce Commission, has continued unchecked by the Department of Justice and is a national disgrace. Coal speculation has been permitted to monopolize the transportation facilities of the country, retarding necessary construction and increasing the basic cost of manufacture and distribution of commodities in general. It has bled the home-owners, public utilities, and the industries.

The imperative necessity of continuity of supply of fuel demands the fulfillment of contractual relations in this industry more than in any other, and yet one of the primary causes for the disgraceful and disastrous conditions during the past six months has been the repudiation of contracts. An exceptional demand not only brings about reckless and unwarranted repudiation of contracts made for delivery of coal but the substitution of inferior quality at higher prices. Indeed, coal contracts are so drawn as to be breakable in delivery, in quality and in price. Our investigation into the coal situation has convinced us that the private interests now in control of the production and distribution of coal, in spite of efforts by some, are actually unable to prevent a continuance or a repetition of the present deplorable situation, and that it is the duty of the government to take such reasonable and practical steps as it may to remedy the evil.

An inherent responsibility of the government is the protection of its people. To assure the mining, transportation and distribution of coal at fair prices is a public duty from which the government cannot escape. But your committee believes that governmental administration of the production and distribution of coal should be a last resort, as governmental activities should always be directed toward encouragement of

private initiative and enterprise. While the fulfillment of contractual relations is of first importance to the stabilization of the industry in the interest of the consumer, the producer, and labor as well, your committee believes that the government should at all times be informed as to coal distribution and recommends:

That all coal operators, wholesalers, jobbers and retailers be compelled by statute to file at regular and frequent periods with some federal agency reports on the total tonnage produced or handled, the size and quality thereof, the amount of tonnage contracted for, the amount sold on contract and at spot sale, to whom, together with the prices made or received under such contracts or sales, and producers and distributors to make regular reports sufficient to determine their costs and profits and the corporate inter-relations or the communities of interest, if any, between companies producing and distributing coal. Fuel thrift by the small user and fuel thrift by the large user through storage, scientific combustion, and transmission should be strongly encouraged by the government.

MICHIGAN CONTRACTORS IN MEMBERSHIP CAMPAIGN.

As the result of the recent meeting of the Michigan State Association of Electrical Contractors and Dealers in Detroit, a campaign has been launched to double the membership and interest every contractor and dealer in the state in the necessity for co-operation in the electrical industry. The campaign is under the immediate direction of H. Shaw, newly elected secretary of the state association, who is also secretary of the Detroit Electrical Contractors' Association.

H. A. Roseberry, Grand Rapids, Mich., was reelected chairman of the state association, and Harry F. Spier, Battle Creek, Mich., was reelected treasurer. Thomas Templeton, of the John H. Busby Co., Detroit, represents the Detroit district as committeeman at large in the national organization.

ELECTRICAL CONTRACTOR-DEALERS TO MEET NEXT MONTH.

The third annual convention of the Pennsylvania State Association of Electrical Contractors and Dealers will be held in Philadelphia, Jan. 26-27. In accordance with the usual custom the sessions will be open to representatives from all branches of the electrical industry for consideration of matters of mutual interest.

The executive committee of the National Association of Electrical Contractors and Dealers will hold a meeting at the association headquarters, 110 West 40th street, New York City, Jan. 24-25.

DECISION OF IOWA COURT ON RATE CONTRACTS.

Supreme Court of Iowa Decrees That Public Utilities and Municipalities Cannot Contract for Definite Arbitrary Rates.

A recent opinion of the Supreme Court of Iowa should prove interesting to central-station companies, in view of the fact that there is agitation on the question of abolishing the state public utilities commissions, and also that practically all public service companies have found it necessary to seek increased rates owing to increased operating expenses and the high rate of money. The case is that of the Ottumwa (Ia.) Railway & Light Co. which held a franchise containing a five-cent fare provision. In 1918 the Ottumwa city council authorized a six-cent fare during the period of the war, but in April of last year this action was rescinded with the declaration that the company should not be permitted to charge more than the fare fixed in its franchise.

The railway company secured a temporary restraining order which was later dissolved by the district court, the case being then carried to the Supreme Court of Iowa on an appeal. This body reversed the decision of the lower court, handing down an opinion that a municipality and a public utility cannot contract for a definite arbitrary rate; that it is against public policy to do so; that the interests of the public demand that the public utility shall receive a sufficient rate to permit it to be operated efficiently and economically, and to pay a reasonable rate to those who have invested their money.

There is no public utilities commission in Iowa, the authority granted by the legislature to the municipalities being practically the same in extent as that granted to the municipalities in Illinois.

BIG CENTRAL-STATION COMPANIES IN CANADA MERGED.

British Columbia Electric Railway Co. Acquires Control of Western Power Co. of Vancouver— Present Capacity of Plants to Be Increased.

A merger of electrical interests on the lower mainland of British Columbia has been brought about by the British Columbia Electric Railway Co., Vancouver, B. C., acquiring control of the Western Power Co. of Canada through the former guaranteeing the $5,000,000 of the latter company's bonds. The Western Power Co., formerly known as the Western Canada Power Co., had a capital of $11,350,000, its president being J. D. Mortimer, 30 Broad street, New York City, who represented United States capital. Its plant develops 39,000 hp. at Stave Falls, 31 miles from Vancouver, and besides selling 75% of its output to the British Columbia Electric Railway Co., power was transmitted to the Puget Sound Power & Light Co. at Sumas, Wash., and light and power retailed in the vicinity of Vancouver and New Westminster, B. C.

The Stave Lake development was originally started by the Stave Lake Power Co., with John Henry as president and William McNeill, now acting general manager of the present company, as secretary. The company later sold its interests to the Western Canada Power Co. The Western Power Co. which took over the Western Canada Power Co. was incorporated in 1916. The capacity of the Western Power Co.'s plant is 150,000,000 kw-hrs. a year, but can be increased by the raising of the dam and the installation of another unit to 200,000,000 kw-hrs. a year, which would then give it a total capacity of 52,000 hp. It is expected that work on the additional unit will be undertaken immediately by the British Columbia Electric Railway Co., the cost being estimated at $1,000,000. The Stave river allows a second development, the site of which is also conveyed in the deal, 3.5 mi. below the present

plant and capable of developing 80,000 to 90,000 hp. on a 50% load factor. The cost would be about $8,000,000.

George Kidd, general manager of the British Columbia Electric Railway Co., who completed the negotiations in the East, states that the acquisition of the other company will not mean that more power is available, because his company has been taking 75% of the Western Power Co.'s output. Provided new capital can be obtained the second development can be proceeded with in two or three years when required. For the immediate needs of the district another unit can be placed in the Stave Lake plant increasing the capacity by 13,000 hp. to a total of 50,000 hp. The installation would cost $1,000,000.

HYDROELECTRIC PLANT TO BE CONSTRUCTED IN MEXICO.

The government of San Luis Potosi, Mexico, has awarded a contract to E. E. Thomas, Tampico, for the construction of a dam and water-storage reservoir in the Rio Verde valley, at an estimated cost of $2,000,000, to provide water for irrigation purposes. Engineers are now making a survey for the proposed project, construction work on which will start about Jan. 1. It is expected that the work will be completed within two years. It is also planned to install a hydroelectric plant with a capacity of 100,000 hp. Power will be distributed over a wide area of the state by means of transmission lines.

MOTOR RATINGS DISCUSSED AT A. I. S. E. E. MEETING.

A discussion on 40-deg. vs. 50-deg. motors was the feature of the Dec. 13 meeting of the Association of Iron and Steel Electrical Engineers at Cleveland. In submitting a paper on "Continuous Rated or 50-deg. Rise Motors," L. F. Adams, electrical engineer of the power and mining department, General Electric Co., favored the 50-deg. motor, stating that it puts the responsibility of selection and operation on the buyer. J. M. Hipple, design engineer of the Westinghouse Electric & Manufacturing Co., stated that lack of education and misunderstanding of the A. I. E. E. rules were retarding the adoption of the 50-deg. motor.

Mill engineers expressed the opinion that a motor driving steel-mill machinery should have a liberal margin of power above the normal or estimated load, and it seemed to be the opinion that this overload ability was met satisfactorily in the 40-deg. motor, although 50-deg. motors are operating with satisfaction on certain loads where careful study was made before the motors were installed.

CHICAGO BANKER DISCUSSES LOCAL UTILITY SITUATION.

In discussing the public utility companies whose financial interests center in and around Chicago, John J. Mitchell, head of the Illinois Trust and Savings Bank, stated recently that the peak of operating costs has been passed, that the price of coal consumed by the central-station companies has declined $3 to $4 a ton during the past month and that labor costs will probably recede. "I think the utility companies have seen their worst days in the matter of high operating costs," he said. "Utility companies, which deal in service, carry small inventories of materials on hand, and their situation is thus more favorable than that of industrial concerns which face large write-offs on inventories Jan. 1. They do a cash business, or virtually so, and do not have outstanding a large amount of bills receivable on which losses might be incurred."

NEWS-SERVICE BUREAU ACTIVITIES OF S. E. D.

Members of the Society for Electrical Development are receiving from headquarters a printed announcement calling attention to the "electrical page" appearing in newspapers throughout the country and the benefits derived by advertisers. The society maintains a news-service bureau which weekly supplies news items, stories, articles, etc., to over 600 newspapers in the United States and Canada, and a sales service department which furnishes advertising material to members.

OKLAHOMA UTILITY IS GRANTED EMERGENCY RATE INCREASE.

The Comanche Light & Power Co., Lawton, Okla., has been granted an emergency scale of rates by the Oklahoma Corporation Commission, permitting a surcharge of $0.015 per kw., retroactive to Dec. 1. The domestic rate is now $0.125, which is about a 13% increase. The surcharge also applies to the former graduated scale.

COMING CONVENTIONS.

Associated General Contractors of America. Second national conference, New Orleans, La., Jan. 25-27. Headquarters, Hotel Grunewald. Secretary, 111 West Washington street, Chicago.

Western Association of Electrical Inspectors. Annual convention, Detroit, Mich., Jan. 25-28. Headquarters, Hotel Statler. Secretary, William S. Boyd, 175 West Jackson boulevard, Chicago.

Pennsylvania State Association of Electrical Contractors and Dealers. Annual convention, Philadelphia, Jan. 26-27. Secretary, M. G. Sellers, 1518 Sansom street, Philadelphia.

Association of Municipal Electrical Utilities of Ontario. Semi-annual convention, Toronto, Can., Jan. 27-28.

National Council of Lighting Fixture Manufacturers. Annual convention and lighting fixture market, Elmwood Music Hall, Buffalo, N. Y., Feb. 14-19. Secretary, Charles H. Hofrichter, 8410 Lake avenue, Cleveland.

Joint meeting of Illinois State Electric Association, Illinois Electric Railways Association and Illinois Gas Association, Chicago, March 15-17. Headquarters, Sherman House. Secretary, R. V. Prather, Springfield, Ill.

American Electrochemical Society. Spring meeting, Atlantic City, N. J., April 21-23. Headquarters, Hotel Chalfonte. Secretary, Joseph W. Richards, Lehigh University, Bethlehem, Pa.

National Fire Protection Association. Annual convention, San Francisco, June 14-16. Secretary, Franklin H. Wentworth, 87 Milk street, Boston.

North Central Electric Association. Annual convention, Duluth, Minn., June 14-16. Secretary, H. E. Young, 15 South Fifth street, Minneapolis, Minn.

American Institute of Electrical Engineers. Annual convention jointly with the Pacific Coast convention, Salt Lake City, Utah, June 20-25. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

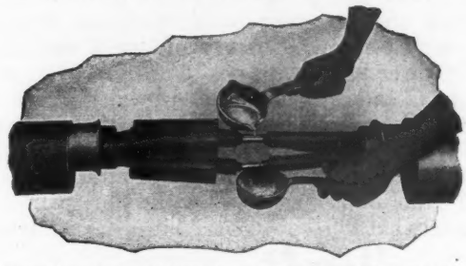
CONTRACTING-CONSTRUCTION

A Department Devoted to Various Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

MAKING AND FINISHING JOINTS IN HIGH-TENSION CABLES.

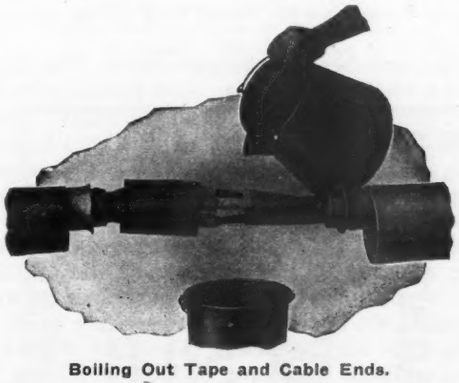
Exclusion of Moisture and Foreign Materials Essential—Joint Should Cool Slowly After Being Filled With Compound.

After the lead has been removed the edge of the lead sheath should be carefully examined and all sharp edges or projections removed with a knife. The ends of the sheath should then be slightly belled out, using a blunt instrument such as the end of the pliers or a special tool. The belt insulation should then be removed to a point about 1.5 ins. from the edge of the lead sheath.



Sweating Connectors and Conductors Together.

The inner layers of belt insulation should be torn rather than cut in order to avoid injury to the insulation on the individual conductors. Jute fillers should be pulled back and cut off close to the end of the belt insulation. The insulation on the individual conductors should now be removed for a distance equal to 5/8 of the length of the copper sleeve. It is good practice to se-



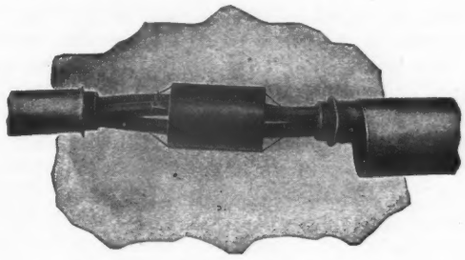
Boiling Out Tape and Cable Ends.

curely fasten the various sections of insulation prior to cutting them off by binding with several turns of string just back of the cut.

With the cable ends prepared, the lead sleeve should then be put in place over one end of the cable. It should be scraped or filed with a rasp for about 2 ins. at each end, the scraped portion being smeared for protection with stearine or some other flux to prevent the formation of a lead-salt film. In case insulating sleeves are to be used they should also be slipped into place at this time and pushed back to make room for soldering the joint.

SWEATING CONDUCTORS INTO CONNECTORS.

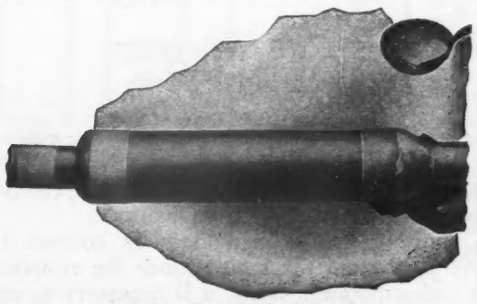
Solder should be applied with a ladle to "tin" the ends of the conductor. After the conductors



Large Insulating Tubes in Place.

have been thoroughly tinned the copper sleeves should be fitted over the conductors, one at a time, and sweated solid. Solder should be poured over the joint and into the split in the sleeve until the entire joint is filled. To make a good job the split in the copper sleeve must be turned up so that solder may be poured into it from the ladle. With the joint well filled the excess solder should be wiped off, leaving a clean, smooth, finished joint. Care must be taken not to disturb the joint until after the solder is fully set or hardened, and a file should not be used to finish the joint unless great care is taken to guard against the settlement of metal dust on the insulation and conductors.

With all joints soldered and wiped off clean the space between the end of the copper sleeve and conductor insulation should be filled with loosely woven cotton tape, one layer of tape being run over the connector. This tape and the cable ends should be boiled out with hot compound in order to drive out all moisture. The compound must be quite hot for this purpose. After all the conductors have been thus prepared, the insulating tubes can be slipped into place to completely cover the joint in the conductor. The insulating tubes should be fastened in place with a piece of stout flax twine to prevent movement,



Wiping One End of Joint.

one small tube being placed over each conductor and a large tube over all the smaller ones. No tape, paper or other material should be placed over the tubes, as such material interferes with the proper filling of the joint with compound. In case tape is used instead of insulating sleeves the procedure must be modified accordingly.

WIPING LEAD SLEEVE OVER FINISHED SPLICE.

The lead sleeve can now be moved into place. The ends of the sleeve must be pounded down to make a snug, close fit to the cable sheath at each side of the joint. It is often found desirable to form the ends of the sleeve before it is placed over the cable. With the sleeve in place and the ends fitting close to the sheath, a little solder should be poured on the sleeve at one end to "tack" it fast to the sheath. Now the opposite end may be wiped without danger of moving the sleeve out of place. After wiping the second end, two holes should be cut in the sleeve and the hot compound poured in through a snugly fitting funnel. A considerable amount of compound should be poured through the joint in order to purge it of all moisture, air, etc. After cooling for a sufficient period the joint should be moved into its place in the manhole or on the cable rack. The Standard Underground Cable Co. recommends that joints be allowed to settle and cool for four or five hours under cover of a pad to exclude dirt and moisture and to prevent rapid cooling. When thoroughly cooled more compound should be poured into the openings to completely fill the joint, and the openings may then be soldered shut.

PRACTICAL METHOD OF TESTING UNLOADED SERIES MOTORS.

Motors Connected as Shunt Machines by Means of Special Testboard—Construction Details—Wiring Diagrams for Tests.

In making repairs on series motors it is usually necessary to remove them from the apparatus they drive. After repairs have been made it is advisable to make tests not only for open circuits but for mechanical stresses such as heat runs on bearings, etc. In a test of this nature, on account of the characteristics of series motors, a prony brake is essential for loading purposes. This method is undesirable, both from an economical and mechanical standpoint, due to the amount of

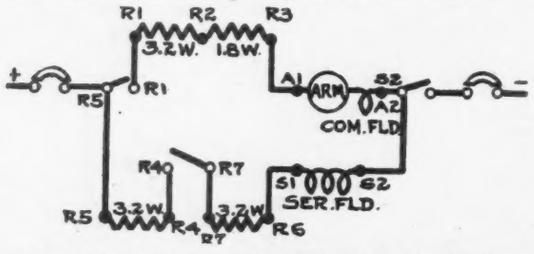


Fig. 1.—Connections for Testing 20 to 30-Hp. Motors.

energy lost in heat, as well as being a cumbersome method with which to work.

A more desirable method is to connect the motor as a shunt machine. Since the resistance of a series motor is small, it is necessary to connect external resistances both in the armature and field circuits, when connected as a shunt machine, to limit the current. The determining factor in the amount of resistance to be placed in the circuits is the current required in the armature to give sufficient torque to cause it to turn and the current required in the field to give proper speed.

Where a great number of motors are to be tested at regular intervals, it is economical to in-

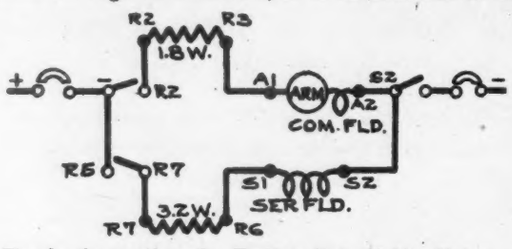


Fig. 2.—Connections for Testing 40 to 60-Hp. Motors.

stall in the repair shop a regular testboard for just this purpose. A board which has been found convenient for this purpose consists of two slate panels mounted vertically on 1.25-in. pipe with two overload and reverse-current circuit-breakers mounted on the upper panel, and two double-pole, double-throw switches mounted vertically on the lower panel with positions marked 1, 2, 3 and 4, as indicated on Fig. 4, which serve to insert resistances when thrown in the different positions according to the horsepower of the machine being tested. It is well to attach a small wood panel immediately below the slate panels to indicate what horsepower machines can be tested

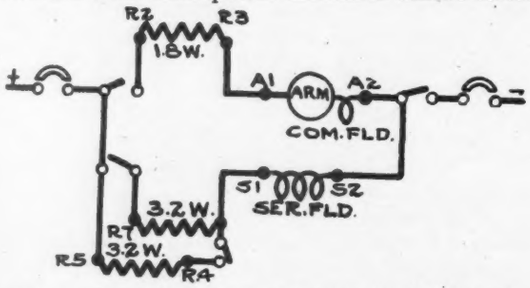


Fig. 3.—Connections for Testing 70 to 100-Hp. Motors.

with the switches in certain positions. The figure shows a method which has been found desirable. Fuses are not required, as an attendant would always be near when a test of this kind is being made.

Fig. 5, which shows a wiring diagram of such a board, illustrates how the same resistance grids could be used for motors ranging in horsepower from 20 to 100. For example, if the switches were in positions 3 and 4, the resistance between the points R1 and R3 of the resistance grids, as marked on Figs. 5 and 1, would be thrown in series with the armature, and the resistance between the points R5 and R6 would be in series with the field. The resistance between the points R1 and R3 is 5 ohms, and between R5 and R6 is 6.4 ohms. This would be the correct position for testing machines from 20 to 30 hp. If, then, the first switch were thrown from position 3 to position 1, the resistance between the points R2 and R3, which is 1.8 ohms, would be in series with the armature, and the resistance between the points R6 and R7, which is 3.2 ohms, would

be in series with the field. This would be the position for testing machines from 40 to 60 hp., as shown on Fig. 2. If the first switch were left in position 1 and the second switch were transferred from position 4 to position 2, the resistance between the points R2 and R3, which is 1.8 ohms, would be in series with the armature; the resistance between the points R6 and R7, equal to 3.2 ohms, and the resistance between the points R4 and R5, equal to 3.2 ohms, would be thrown in parallel, and the combination thrown in series with the field. This, then, would give a resistance of 1.6 ohms, and would be the position for testing machines ranging from 70 to 100 hp.

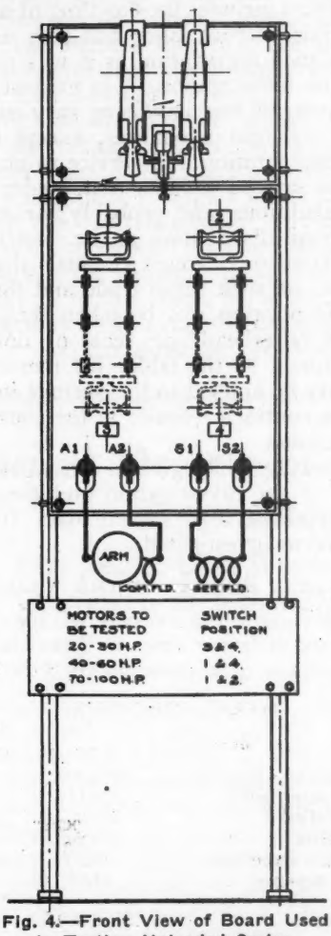


Fig. 4.—Front View of Board Used in Testing Unloaded Series Motors.

PROTECTION FOR MOTORS REQUIRED BY 1920 CODE.

Motors Rated in Excess of 2 Hp. Must Be Protected by Running Fuses, Circuit-Breakers or Thermal Cutouts.

Overload protection of motors received much attention in the preparation of the last edition of the National Electrical Code. The rule applying to motors of over 2-hp. capacity contains the following provisions:

"Each continuous-rated motor over 2 hp. used for constant-load duty must be protected by running fuses, thermal cutouts or a circuit-breaker in accordance with the following:

"If fuses or thermal cutouts are used their rated capacity must not exceed 125% of the name-plate current rating of the motor, except that when no fuses or thermal cutouts of the required capacity exist those of the next higher standard rating may be used. If a circuit-breaker is used it should have a continuous current capacity of at least 110% of the name-plate current rating of the motor. If the circuit-breaker is of the time-limit type it should have a setting of not over 125%, and if of the instantaneous type a setting of not over 160% of the name-plate current rating of the motor."

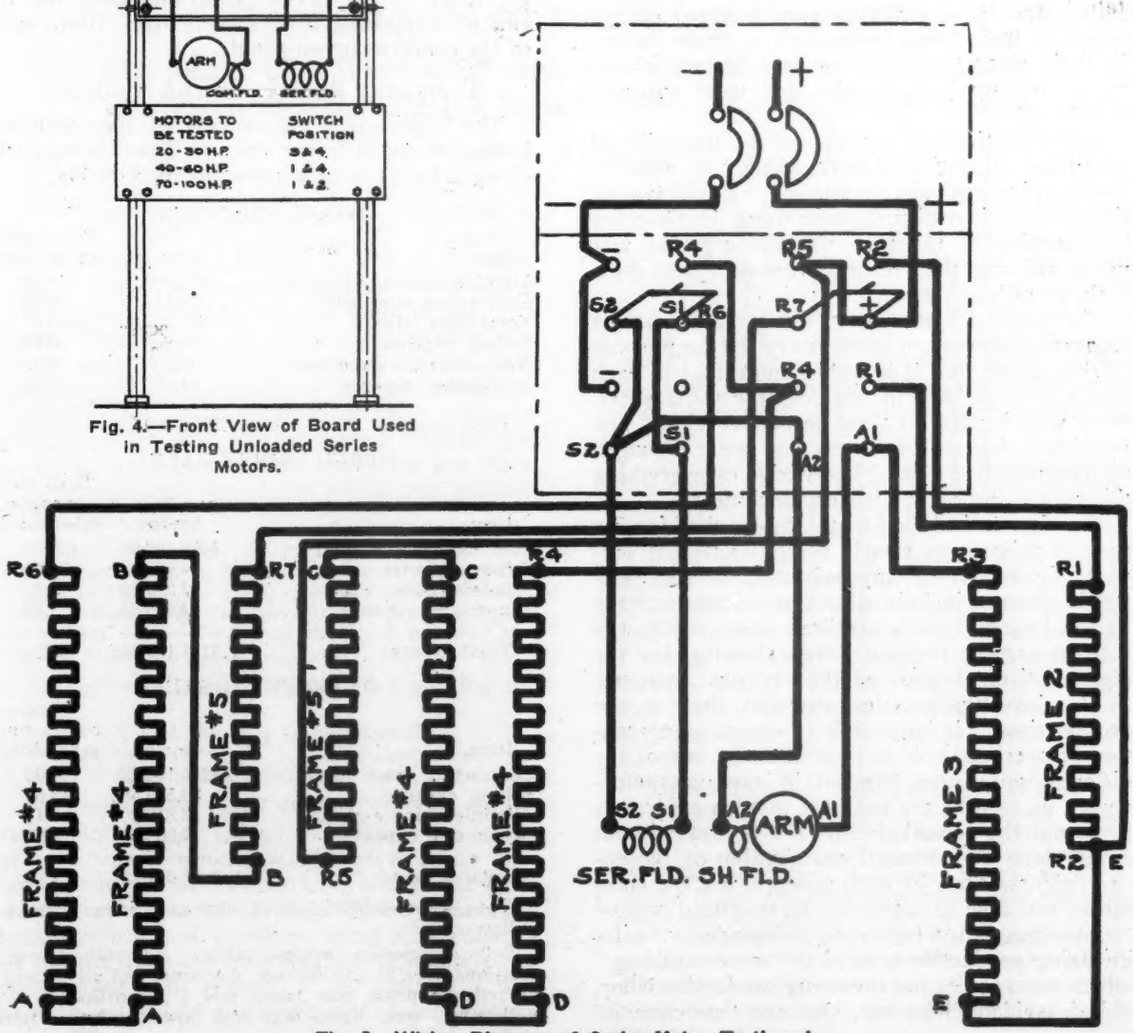


Fig. 5.—Wiring Diagram of Series-Motor Testboard.

CONTRACTOR-DEALER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Goods

ANALYSIS OF OVERHEAD, OR COST OF DOING BUSINESS.

Report of Executive Committee of National Association of Contractor-Dealers, Also Sent to Jobbers and Manufacturers.

The following report is based on a personal investigation made by an accountant in the employ of the National Association of Electrical Contractors and Dealers and supplements the figures previously obtained from the membership by means of a questionnaire.

The investigation was undertaken for two purposes: first, to check the figures that have been compiled and published and which were based on the replies made by the membership; second, in the hope of being able to obtain some segregation of overhead cost on the different classes of appliances sold by the contractor-dealer.

The investigation covered six different concerns located in six different cities and in three states, and these concerns were selected on account of their being recognized as trade leaders in their respective localities and having investments and total gross sales that were approximately alike.

The investigation emphasizes the necessity of continued educational work along the lines of bookkeeping and cost accounting, as only two of the concerns investigated were using double-entry bookkeeping at the time the investigation was made, although their records were such as to show their operations clearly.

The detailed figures as to the operation of the separate concerns are unnecessary for the purpose of this report, but it is well to note that in each case they had been in business for some years, were well located in their respective cities, had well-kept places of business and were managed by men who had a good knowledge of everything that was going on in their establishment.

The figures included in the tables that form a part of this report clearly demonstrate that previous figures, while approximately correct, evidently did not include all expense items and the figures herewith show overhead costs, which it is safe to assume present a true showing for the merchandising branch of the electrical industry.

The investigation demonstrated that at the present time it is impossible to obtain a segregation of overhead cost as applied to the sale of the different appliances handled by the contractor-dealer, as records are not kept in such a form as to permit the compilation of the figures without a very long and detailed examination of the entire business done by each concern, but the committee was able to segregate the overhead cost of "contracting," in which term is included all sales involving productive labor, and "merchandising," which covers sales not involving productive labor.

It is evident, however, that the "merchandising" of electrical appliances to the public at the present time is largely carried on by concerns whose business includes the handling of appliances and materials without labor and also with labor and, from such segregation as it was possible to make in the investigation, it is evident that the overhead costs of merchandising vary only slightly on the different appliances, except those requiring demonstration and service to maintain.

It seems safe to assume that, under existing business conditions, and probably for some time to come, retail distribution in the electrical trade will be carried on through channels that handle all branches of such retail trade and that consequently the position can be taken that the percentage of "overhead" or "cost of doing business" as shown by the tables for merchandising can properly be applied to the various items handled by the contractor-dealer in the course of his regular business.

The following tables give in a condensed form the result of the investigation and they are, of course, supported by complete data from each of the concerns investigated.

Tabulated Results of the Analysis.

The tables show the average of six concerns, located in six different cities in three states, each doing a business of approximately $100,000.

TOTAL BUSINESS.

Item.	Amount.	% of total sales billed.
Merchandise sales billed	$400,192.98	64.00
Contracting sales billed	225,114.92	36.00
Total sales billed	625,307.90	100.00
Selling expense	105,209.86	16.83
Administration expense	49,203.32	7.87
Accounting expense	21,967.42	3.51
Total expense	$176,380.60	28.21

MERCHANDISE SALES.

Item.	Amount.	% of merchandising sales billed.
Merchandise sales billed	$400,192.98	100.00
Selling expense	74,660.38	18.66
Administration expense	32,390.12	8.09
Accounting expense	14,058.88	3.55
Total expense	$121,109.38	30.20

CONTRACTING SALES.

Item.	Amount.	% of contracting sales billed.
Contracting sales billed	$225,114.92	100.00
Selling expense	30,549.58	13.57
Administration expense	16,813.20	7.47
Accounting expense	7,908.54	3.51
Total expense	$ 55,271.22	24.55

Note.—The subdivision of expenses were made as follows:

Selling expenses includes interest, advertising, commissions, freight and cartage, discounts and allowances, traveling expense, war taxes, and a proportion of the following: rent, light, heat and power, salaries, tele-

phone, telegraph and postage, printing and stationery, miscellaneous expense.

Administration includes depreciation, insurance, legal expense, taxes, maintenance, bad debts and a proportion of the last five items under selling expense.

Accounting includes bonding expense and a proportion of the last five items under selling expense.

It will be seen that the foregoing indicates the average overhead cost of doing business to be 30.20% for merchandising, 24.55% for contracting and 28.21% for the total business, and it is safe to consider these figures as being conservative in view of the careful investigation and in view of the further fact that the investigation covered concerns that are probably above the average in their business methods.

Comment on the question of the selling price in the "contracting" end of the business is perhaps unnecessary as the margin between the cost and the selling price is largely in the hands of the seller, but the "merchandising" situation is certainly worthy of careful thought and some action on the part of the national association.

The figures in this report show that a discount of 30.2% only just covers the overhead cost and a further discount must be provided to enable the contractor-dealers to make a fair margin of profit on sales.

This brings the merchandising question to the point where, if it is to be handled aggressively by the contractor-dealer, the margin between cost and selling prices must be increased or the overhead expense must be reduced, and the investigation, as well as the figures obtained from other lines of retail trade, leads to the conclusion that the overhead percentage given in this report can not be materially reduced without impairing the efficiency of the service rendered.

Increased differences between cost and selling price can be brought about by a reduction in cost to the contractor-dealer or an increased price to the consumer.

The first is beyond the committee's province to comment on, and in considering the second, careful consideration must be given to the economic value of the goods to see that the price does not force them into the class of luxuries.

On the other hand a continuance of the existing condition must, when thoroughly understood by the retailer, result in a lack of effort to increase distribution.

Electrical Dealers of Northwest Use Modern Methods in Appliance Merchandising Business

One Dealer Uses Window Effectively for Demonstration of Household Conveniences, Other Dealers Equally Energetic in Creating Business

By W. B. STODDARD

"In order to get the business, you must do something a little different," said the manager of the Burnham-Frith Electric Co., Ltd., Edmonton, Alta. "And you've got to occasionally make it worth their while to stop and look at your displays. Now that winter is here people should be in the market for more electrical devices than ever, if the merchandise can just be brought to their attention in an effective manner. We decided to begin with the convenient little electric stove, so much cleaner than the oil or gas burners. Accordingly we placed one in our window, with a card beside it:

A customer claims she can fry at the rate of fifty eggs an hour on this stove. One hour's current costs 4.8 cents. We will give $5 in cash to the first lady customer who can beat this record. Must have a witness. Full information inside. A hot meal in a few minutes.

Another card gave information regarding the price:

A Red-Hot Fire in 30 Seconds.
$5.00 Plain. $5.50 Enamelled.
Not One Back in Three Years.

Naturally these cards aroused interest in the stoves, and the adroit method in which the frying of eggs was mentioned suggested to many how convenient it would be to have one of the little stoves for light housekeeping. A very attractive background was also built up, hung with garlands of autumn leaves. A long shelf in the background was draped with crimson velvet and on it was placed a stand and boudoir lamp, several electric student lamps and an electric fan. Down in front were set several portable electric heaters.

"We knew that the offer would give ample publicity to the stoves, but in order to push the sale of the other merchandise we had cards, on each of which was printed in colors, a single lamp. There were several types of these lamps—floor, stand, boudoir, etc. With each lamp was a brief dsecription and price, together with the suggestion:

Come to the Lamp Shop of the Burnham-Frith Electric Co., Ltd., and see our "lamps of originality" for lighting the boudoir or den, living or dining room, in the long winter evenings.

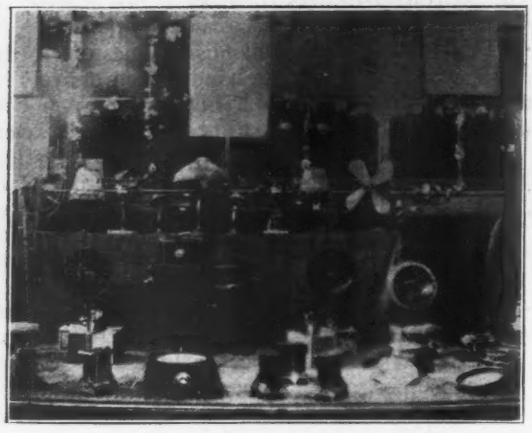
"These we distributed freely. Then we arranged a fixture display in one of the windows and supplemented it with various types of globes. Cards in this window called special attention to all classes of electric lamps and fixtures and offered a special discount of 25% for two days only. We backed up our card and window publicity with quarter-page advertisements in the papers:

HARMONIOUS ELECTRIC FIXTURES.

Good lighting is an essential part of living. Two things are necessary to good home lighting: Fixtures that can be adjusted to control and concentrate the light, and fixtures that please the eye by their correct design and style, harmonizing with the furniture and decorations.

It is surprising how small the expenditure to make the home thoroughly modern and cheerful.

"Lastly, in order to get the public to notice our electric heaters we ran an advertisement in the



Window Display of Burnham-Firth Electric Co., Edmonton, Alta., Can.

paper adorned with the cut of mother and little child standing before the cheerful blaze, and captioned:

OH! DANDY!
For These Cold Winter Mornings
AN ELECTRIC RADIATOR.

Avoid the well-known danger of a chilly room. The warm glow of the electric coils immediately insures your health and comfort.

The Electric Radiator is one thoroughly practical adjunct to your regular heating system.

IT IS EASY TO OWN ONE.
Pay for it in five installments on your light bills.

"Then, in the vestibule of the store we installed one of the electric heaters with a cord and push button, and by the button placed a card:

DOES AN ELECTRIC HEATER THROW OUT MUCH HEAT?
Push the Button and See.

"Naturally the great majority pushed the button and at once felt the warm glow, doubly comfortable on a frosty morning. It would be hard to imagine a better method of publicity. Attached to the pedestal on which stood the heater was a little metal box holding a number of pamphlets, the card above it inviting 'Take One.' These gave cuts of this particular style of electric heater as well as several others, with prices, and a slight description of the best points of each. In this way, by always having something of interest in the store or in the window, we got people into the habit of coming around to see our newest 'wrinkle' and gradually to associating our name with high-class electrical merchandise, causing them to turn naturally to our store when in need of anything in the electric line."

Some Methods of Washington State Electrical Dealers.

In the state of Washington there are many electrical men who are progressive. Realizing that electricity is going to be the dominating factor in domestic economy within the next few years they are exerting every energy towards acquainting the general public with their line.

The Seattle Lighting Co., Seattle, Wash., have a series of rooms opening into each other, each being fitted with the necessary electrical appliances for accomplishing housework in the most expeditious manner. The elecric kitchen is being given the greatest publicity at present, in order to speed up the sale of electric ranges. Next to it is the laundry equipped with washing and ironing machines, laundry stoves, wringers and electric clothes dryers. Once a week practical demonstrations of these appliances are given. Then there is the electric dining room and the living room with student lamp, electric heater and vacuum cleaner. They constantly back up their floor displays with attractive advertisements. One of the advertisements showed a cut of an electric range and opposite it a hand with the fingers extended and a number printed at the tip of each finger. The advertisement was captioned:

FIVE BIG REASONS.

Count on the fingers of your hand the advantages of the Electric Range as a household helper:

1. It is clean. You don't have to fuss with sooty, dirty coal.
2. It is prompt. Your fuel is always ready at a moment's notice.
3. It is cool. It does not heat up your kitchen.
4. It is controliable. The heat can be regulated so exactly that perfect cooking can be insured.
5. It is economical. With the present price of coal, you will find that electric current is cheaper.

SEATTLE LIGHTING CO.

The Ernst Co., Seattle, goes after business enthusiastically. It has a special service truck, painted white, with trimmings of blue, decorated with a flock of bluebirds. This the company uses in delivering its electric merchandise and in making quick runs when repairs of any kind are needed. The advertisements in the paper read: "Send for the Bluebird Flier when anything goes wrong with your electric service." The company is a thorough believer in window displays and employs a man whose entire time is devoted to the arranging of these displays.

"It is my firm conviction," said A. G. Heinmiller, the manager, "that the selling power of merchandise is increased fully 100% as soon as it is displayed in the window. We never feature but one line at a time, in order not to confuse the mind, but every window is changed twice and sometimes three times a week. For this reason the arrangement is always simple, with harmonious backgrounds, and just a few objects in order that the good points of each may be seen. Take, for example, our display of electric irons. The background is of dove gray, with several throws of olive-green velvet. In the midst is an

Demonstration Rooms in Store of Seattle Lighting Co., Seattle, Wash.

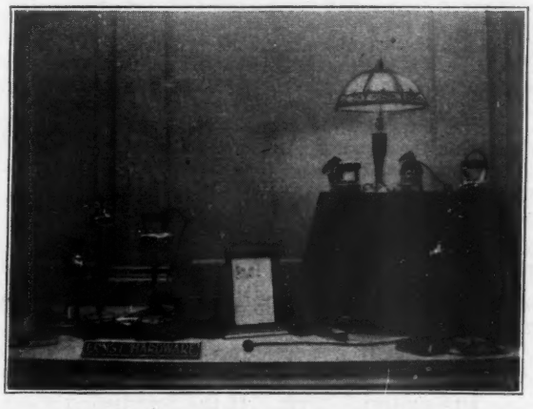
electric lamp, with art shade. Half a dozen electric flatirons of the modern type are shown, as well as an antique—one of the first electric irons made.

"We always use a card or two, as a window without them is like a dumb salesman. The one we use with our display of flatirons read: 'You are sure to find this store the best place to purchase an electric flatiron, as our stock and assortment is an extensive one and our prices most reasonable.'

USING SHOW WINDOW FOR DEMONSTRATION PURPOSES.

"The window near the entrance is used solely for demonstration purposes. The glass extends almost to the level of the street and the floor of the window is on the level of the store floor. We have found that the average patron will not make himself conspicuous by stepping into a window to get a closer view of any apparatus in which he is interested, but where he does not have to mount a platform, will readily come over to examine the appliance. The mere fact of seeing several people in the window will induce other passersby to come in, and we thus secure an audience to whom the demonstrator can talk as well as demonstrate.

"Each week we demonstrate a different appliance. Washing machines, ironers, sweepers, dishwashers, hair driers and the various electrical table conveniences each have their turn. In each case the room—for it is a room rather than a window—is fitted up with an appropriate background and the prospective purchaser is able to visualize just how it would look in her own home.



Window Display of Ernst's, Seattle, Wash.

Then, too, it suggests new uses for each appliance and calls it to their attention in a striking manner."

That Seattle does not have a monopoly on originality and progressiveness, however, is evidenced by the educational home-buying campaign carried on by the leading merchants of Puyallup, Wash. Two columns in the center of the page are taken up with an article headed, "One Is Born Every Minute," detailing some of the experiences of customers dealing with mail-order houses. The balance of the page is taken up with advertisements of the principal merchants. One of the best of these is that of the Parsons Electrical Co., which reads: "Buy at home when you buy for the home. Don't let the threatened coal shortage catch you unprepared. We suggest the modern way of cooking and heating—the electric range and the electric heater."

The firm supplements its newspaper advertising with crisp window displays, changed frequently and by means of electric merchandising literature furnished by the manufacturers, sent periodically to a selected list of prospects.

CONTRACTOR BELIEVES IN ARTISTIC WINDOW DISPLAYS.

Window Specialist Employed by New Jersey Man Installs Esthetic Decorations in Display Window at Fortnight Intervals.

Emil Ammann, electrical contractor in Union Hill, N. J., is a firm believer in the value of artistic window trimming. The accompanying view shows the effect of window magic produced

This Class of Window Trim Expensive But Effective Advertising.

by a firm of window-trim specialists with whom Mr. Ammann has contracted to supply trims and accessories for various displays and to change the display every two weeks throughout the year.

"Many electrical contractors and dealers would be surprised to know what this costs," said Mr. Ammann, "but it pays. I know it pays for I go over my books every month and they tell the story." The effect of such a display upon the observer is intended to impress the beauty and sense of luxury obtained by the employment of electric lighting installed by competent electricians.

NEWSPAPER ADVERTISING AID TO MERCHANDISING.

"Contractor-dealers are not doing the amount of newspaper advertising they are capable of, and the public will never be well served until the contractor-dealer does his part in telling the public how well he can serve it," says Ainslie A. Gray, advertising counsel for the National Electrical Supply Jobbers' Association. Where conditions are such that it is impossible for the contractor-dealer to maintain space in the newspapers for his individual advertisement, Mr. Gray advises that collective advertisements, participated in by a number of contractor-dealers in the same community, is the next best plan.

QUESTIONS AND ANSWERS

All Readers Are Invited to Submit Contributions on Electrical Matters to This Department—Answers Should Be Sent Within Eight Days of Date of Publication of Question—Payment Will Be Made for All Answers Published

Questions.

No. 510.—ADVISABILITY OF HOLDING SALES OF ELECTRICAL GOODS.—I have been endeavoring to learn from various sources, including jobbers, dealers, etc., the advantages to be gained by and the difficulties met with in conducting a sale or sales of electrical goods. Other merchants have sales for the purpose of raising money, reducing stock, and cultivating new customers, and I want to find out if the electrical dealer can benefit by following their example. Will dealers or others in touch with the situation give their views on the subject?—W. R. B., Phoenix, Ariz.

No. 514.—ILLUMINATION OF A MACHINE SHOP.—What is the best method to employ, and what intensity in foot-candles should be used, in lighting a fairly large machine shop? The shop in question is 50 by 200 ft. in size, and has a saw-tooth roof with windows all along both sides and the ends. Drill presses, planers, shapers, saws, milling machines and other tools all have individual motors so that there are no belts to interfere with overhead installation. Should a system of general illuminating be installed, or would a mixed system of general and local lighting be better or cheaper? What special provision should be made for the work benches along the sides of the shop? If general illumination is best, what intensity should be used, and what size lamps would give the best results?—N. S. T., Detroit.

No. 515.—PRECAUTIONS TAKEN IN GROUNDING LINES AND BUSES.—What precautions are taken to guard against errors in making ground connections in power houses to high-tension cables and buses? Mistakes that have been costly in both life and property have been made, and it is believed that a free discussion of present common practice will be of much benefit. What bus- and line-clip arrangements are used? What locks and hold cards are used? Is it common practice to check connections twice or to have two different men check the connections? Are definite steps taken to see that the ground is maintained even though a mistake has been made?—A. L. T., New York City.

No. 516.—WINDING FOR THREE-PHASE MOTOR.—I have a four-pole, 220-volt, three-phase induction motor rated at 0.5 hp. and rewound with 24 coils in 24 slots. The coils are arranged and connected as a lap winding. The motor which was made by the General Electric Co., Schenectady, N. Y., has a squirrel-cage rotor. The coils are connected in one Y circuit, there being two coils per group with 109 turns of No. 20 double-cotton-covered wire per group. The winding pitch is from 1 to 6.

Will someone draw a diagram illustrating the direction of current flow in the windings described above? Considerable trouble is being experienced with heating. It is believed that some of the coils are bucking each other. The full-pitch winding of this motor would be from 1 to 7.—R. J. B., Racine, Wis.

Answers.

No. 504.—CONTROLLING MOTOR FROM TWO LOCATIONS.—I have a 5-hp. induction motor which is started from half-taps on a three-phase transformer bank by means of a three-pole, double-throw switch. Will someone please show how such a motor can be started and stopped from two different locations?—N. W. C., Denver, Colo.

Answer.—The accompanying sketch shows the control of a three-phase motor from two locations. To stop the motor by one switch when it was running from the other would require a system of relays and would involve considerable expense, if half-taps are used in starting. If the half-taps are omitted, and the three-pole double-throw switches replaced by two starting compensators with no-voltage releases, great flexibility in operating is obtained. The accompanying sketch

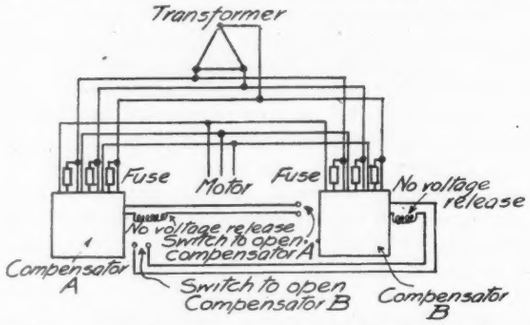


Diagram of Connections for Remote Control of Motor From Two Points.

shows the connections of this arrangement. It is to be noted that the circuit of either no-voltage coil may be broken at the remote switch.—W. H. K., Evanston, Ill.

No. 508.—BURNED LAMINATIONS IN MOTOR ARMATURE.—I have a 5-hp., 1200-r.p.m., 220-volt, d-c. motor the armature of which has been burned out by severe grounding of several coils. This grounding fused together the laminations in sections about 0.5 in. square in four different places. These spots are in different slots and each one affects a different set of laminations. Will it be safe to file out the slots to a smooth finish and rewind the armature, or should I secure new laminations and replace those that have been welded together?—A. L. S., Topeka, Kan.

Answer.—Unless the laminations of an armature core are insulated from each other with thin shellac or some other insulating medium much loss is experienced through eddy currents. Regarding the armature core in question, the writer would not deem it necessary to reconstruct the core as the burned areas are not sufficiently large to do any material harm. If the roughened spots are smoothed out with a file the armature can be rewound and produce the same results as before grounding occurred.—W. F. P., Atlantic, Mass.

Answer.—If the fused spots do not penetrate too deeply it will be safe to file out the slots with a smooth file, afterward using a needle-pointed tool to remove the edges of the laminations that have been turned over in filing. In rewinding extra insulation will have to be used to make up for the material filed away. Should the burns penetrate too deeply it would be safer to replace the damaged laminations.—J. S., Cumberland, B. C.

No. 509.—CONNECTING SINGLE TRANSFORMER IN A THREE-PHASE BANK.—I have three single-phase, 5-kv-a. Westinghouse transformers, rated at 2200 to 220 and 110 volts, and want to know if I can use them connected together on a three-phase circuit and get 220 and 110

volts on the secondary side. If so, will someone please explain how to connect them and make a simple diagram for a guide?—R. L. G., Reynolda, N. C.

Answer.—There are several ways of connecting the transformers in a three-phase circuit, but the simplest way is the delta connection. The transformers are placed side by side, connecting one primary terminal of the first transformer to the adjacent terminal of the second, the other terminal of the second to the adjacent terminal of the third, and the remaining terminal of the third to the remaining one of the first, thus making a complete circuit. Each one of the joints

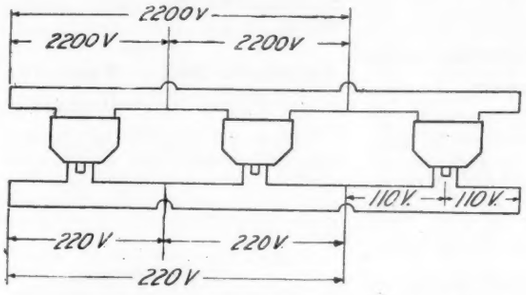


Diagram of Delta-Delta Transformer Connection.

should then be connected to one of the supply mains. In the same way the secondary terminals should be connected to the secondary lines. These transformers are made with the secondary coils in two parts and having four taps. If the first and second taps and the third and fourth taps are connected in pairs, and each pair used as a main, the coils are in parallel and the transformer will give 110 volts. If the second and third taps are connected together, and the first and fourth taps used as mains, the coils are in series and the transformer will give 220 volts. The accompanying diagram shows the connections.—J. O. P., Larkin, Kan.

No. 511.—Transformer Operated at Higher Frequency.—I have a 10-kw. transformer rated at 2200 to 220 volts and 25 cycles. I would like to use this transformer on a 60-cycle line, but am afraid it will overheat or possibly burn out as soon as it is connected up. Will someone kindly advise me as to what would happen if such a transformer were connected to a 60-cycle line? How much load will it carry without overheating? What capacity fuses should I use on the high-tension side to protect the transformer? This is an ordinary oil-cooled outdoor transformer with four primary and four secondary terminals.—F. H. B., St. Louis, Mo.

Answer.—There is no cause for apprehension in connecting this transformer to a 60-cycle line if not more than the normal 10-kw. load is taken out of it. From the transformer equation $K = (E \times 10^8)/(4.44 \times N \times f)$ where K is magnetic flux, E the voltage, N number of turns and f the frequency, it can readily be seen that the magnetic flux is in inverse proportion to the frequency so that the transformer would run with a considerably reduced magnetic saturation if connected simply to a 60-cycle line with the same voltage. As there are four terminals to each side it is, perhaps, possible to reconnect the high-tension coils in parallel if they are now in series. This would give a flux that is about 16% lower for 60 cycles than for 25 cycles, which is as it should be. The low-tension coils must then also be connected in parallel if they have been in series before. This would again give the same low-tension voltage as before. If, however, the coils have already been in parallel, or if one side has been in series and the other in parallel, they cannot be changed, and the transformer has to be run as it is on the new 60-cycle line. Of course, the regulation of this transformer will not be as good when operated on 60 cycles as when operated on 25 cycles. It would, however, be a little better with the reconnected coils than with the coils as they are at present. The inductive drop is higher with 60 cycles than with 25; therefore, the voltage drop from no load to full load will be greater for the 60 cycles, especially if a reconnection of the coils is not possible or is not desired.

Fuses for the protection of the transformer can remain as before if the load is not increased. The heating of the transformer with the reconnected coils would be approximately the same as it is now; if not reconnected, however, the temperature rise will be less than it was.—M. H., Pittsburgh, Pa.

Answer.—The 25-cycle transformer in question will not heat as much when operated on a 60-cycle frequency as it would on a 25-cycle frequency. It will be safe to carry the full rating of the transformer. It is advisable to fuse with a 5 to 7-ampere fuse, preferably using fuses of 5-ampere rating if the transformer will not be overloaded.—V. H., Springfield, Ill.

No. 513.—Leading and Lagging Current in Synchronous Motor.—In the Nov. 13 issue of Electrical Review A. S. L. said, in answer to question No. 495, "These facts are so well known that proof is not necessary, though simple physical nonmathematical proof is easily possible." I have studied the answers given to question No. 495, but am not sure that I fully understand the action of a synchronous motor as a condenser yet. Will A. S. L., or someone else, explain more fully the points referred to in the above quotation?—S. B. H., Portland, Ore.

Answer.—A condenser—static or otherwise—when connected to an a-c. system draws a leading current and, therefore, tends to neutralize any lagging current that exists in the system and thereby improve the low power-factor. A synchronous motor can if desired be operated with its armature current in phase with the applied electromotive force by proper adjustment of its field current. If the field current is increased with the load of the motor and the applied voltage remains unchanged the motor will draw a leading current from the line.

This leading current may be segregated into two components: First, an energy component whose function is to drive a mechanical load and to supply the losses of the motor, and second, a magnetizing current, i. e., a current which tends to magnetize the generator fields. This is the so-called "wattless leading component" or "condenser effect." The condenser effect, or wattless leading component, of the synchronous-motor current may be used to compensate for or to neutralize an equal amount of inductive effect, or wattless lagging component, on the system caused by induction motors, transformers, etc., and thereby improve the power-factor of the whole system.—L. G. S., Brooklyn, N. Y.

NEW APPLIANCES

Newly Developed and Improved Electrical and Mechanical Apparatus, Appliances, and Devices Now Being Placed on the Market

Visual Indicator and Socket Extension for Appliances.

An indicator which tells at a glance whether the current is "on" or "off" when devices such as electric flat irons, cooking equipment, percolators, water heaters, shaving mugs, glue pots and

Combination Socket Extension and Indicating Device.

other appliances which use from 300 to 700 watts are connected to the lighting circuit has been placed on the market by the Bergman Co., 5428 Fulton street, Chicago.

The device can also be used as a socket extension where it is difficult to insert the plug into a socket which is covered by a narrow shade, or when it is necessary to attach a large lamp to a socket which is covered by a small narrow shade.

The indicator consists of a solenoid-type electromagnet set in the upper end of the tube and connected in series with the appliance and the line. A small armature with a pointer attached on the lower end is placed in the solenoid. When the electromagnet is energized, the armature is attracted upward until the pointer reaches its position opposite the word "ON." When the current is opened the armature falls and the pointer falls to position marked "OFF." The indicator is inserted into an ordinary lighting socket, and has an outlet at the lower end for attaching the cord from an electrical appliance.

"Wink-a-Lites" Flasher Plug.

A flasher plug, particularly suitable for service in connection with Christmas-tree lighting, is being placed on the market by the Betts & Betts Corp., New York City. As a window decoration, an arrangement of two or three of these sets on the same tree or on different trees produces a particularly pleasing effect. As a home attraction it should also prove a good novelty at Christmas time.

Two-Speed Ironing Machine with Ruffle Attachment.

The new "Thor" electric ironer is described by the manufacture, Hurley Machine Co., Chicago, as representing an entirely new mechanical departure in home labor-saving appliances. This new ironer removes much of the work from ironing, for the operation of the ironer itself is automatic.

A small lever conveniently placed on the feed board throws the shoe into gear with the motor, and the shoe moves smoothly into one of three open positions, or into the closed position, as the operator may desire. Two buttons placed on the control lever are shifted up and down according to the position into which the shoe is to be moved. The operation is extremely simple and requires no more effort than turning an electric switch. The operator is thus relieved of the exertion and time required in operating the shoe by hand or foot pressure, and the hands are left free to guide the pieces being ironed. This complete control of all operations enables the woman to iron when sitting as easily as when standing, and without the necessity of getting up for any of the operations.

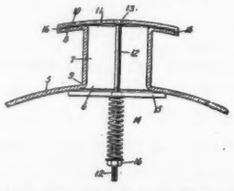
For the further convenience of the operator the roll is given two speeds, one a standard speed of 8 ft. per min. for heavy pieces, and the other of 12.5 ft. per min. for handkerchiefs, towels, and other light pieces. Another feature of equal importance from a mechanical standpoint is the direct shaft drive

Electric Ironer for Household Use.

which eliminates all belts and pulleys. All gears are inclosed and run in a lubricant, and no oiling is necessary. The supporting arm at the left end of the roll is built so as to permit easy ironing of not only collar and cuffs, but also ruffles and pleats. The demountable frame is built on the three-point-suspension principle. This is to insure an even pressure of the shoe against the roll, though the floor upon which the machine rests is uneven. Large swivel casters permit the ironer to be easily moved.

Automatic Safety Valve for Oil-Filled Transformers.

Danger of explosion in transformers, although remote, does always exist, and a safety valve that will relieve the pressure is of use in connection with oil-filled transformers. The Pittsburgh



Safety Valve for Oil-Filled Transformers.

Transformer Co., Pittsburgh, Pa., has developed the safety valve here shown, which is simple in both design and operation.

The passage formed by the safety valve has no turns or angles, but is a direct, straight, vertical outlet. The safety valve is automatic and self closing, and after it has operated and relieved the pressure it will immediately reset and thus prevent rain or snow from entering the transformer. On the Pittsburgh safety valve the spring can be readily adjusted to any pressure desired and this spring, always being submerged in the transformer oil, cannot rust or deteriorate in any way.

Sectionalized Driving Equipment for Paper Mills.

A new type of sectionalized motor drive for paper machines, which possesses many interesting features, has recently been developed by the General Electric Co., Schnectady, N. Y. The first equipment has just been put into operation at the mill of the Crown Williamette Paper Co., West Lynn, Oregon. Electrical operation of paper machines during the past has been practically confined to the use of a single unit either belted or direct-connected to the variable-speed line shaft. Speed variation was obtained by a combination of field and voltage manipulation on the motor which was driven from a generator either belted or direct-connected to the steam engine driving the constant-speed shaft. Sectionalized drive has not been used, possibly because the trade has not demanded it. The speeds at which paper machines have been run hitherto have not made such drive necessary. The sectionalized drive was developed to meet the demand for high speed on the large paper

machines, and it is not expected that the single-motor type of drive will be entirely supplanted where operating conditions make it good engineering to use the older type of electric drive.

The demand for high-speed paper machines, and the difficulty of using a mechanical drive, have focused attention on the sectionalized drive and made it practically necessary to meet the demands of the trade. Other features which favor the sectionalized drive are the elimination of the line shafts and belting and the saving of space. It is particularly adaptable to mills where the paper machine is on the floor, and although such a drive will eliminate the necessity for a basement in the mill this is not considered an advantage by all paper manufacturers.

There are several types of sectionalized drive on the market, all of which, with the exception of the General Electric drive, have some form of speed governor which cannot act until a change in speed has actually taken place; in other words, something must happen before it can be corrected, and there is a possibility of breaking the sheet before the governor functions.

The new sectionalized drive is entirely different since it prevents a change in speed from taking place, and consequently it does not have to correct a change. This drive consists of a separate unit for each section of the paper machine. Each unit consists of a d-c. motor and a synchronous motor of about 20% of the capacity of the d-c. motor, the synchronous motor being driven from the d-c. motor through a gear reduction and a set of cones which permit of a total range in speed of 12%. The motors and cones are mounted on a common base and are direct-connected to the section of the paper machine.

All of the motor units are driven from a single generator on which the voltages are varied by means of field control to obtain a variation in speed on the paper machine. For ranges in speed not exceeding six to one field control on the motors is not necessary, but beyond this range a combination of voltage and field control is necessary to insure a good speed regulation. All d-c. units are operated in multiple from the generator bus, and all synchronous motors are connected to a dead bus. All d-c. and synchronous-motor fields and the generator field are connected to the exciter bus which is of sufficient capacity to excite all machines.

Each d-c. motor has a drum controller and rheostat in its circuit for individual starting, the last point of this controller being in the auxiliary circuit of the contactor which connects the synchronous motor to the dead bus. The actual closing of this contactor is by means of a push button, but it can only be done when the controller is on the last point.

The control of this equipment is very simple and similar to the standard paper-machine drive of the past. The auxiliary control panel which controls the speed of the entire paper machine as a unit consists of a small panel on which is mounted a speed indicator, a 9-in. rheostat hand wheel and a push-button station for starting and stopping. In addition to this control equipment there is a small indicating panel for each section.

When starting the paper machine as a unit the drum controllers in the d-c. motor circuits should all be on the last point with the synchronous motors connected to the dead bus. The starting button on the auxiliary control panel will close the line contactor on the motor-generator panel and apply a low voltage to all the d-c. motors, turning them over at a slow speed. The synchronous motors, being geared and belted to the d-c. motors, will also turn over with them and, since they are all connected to the same bus, they will start up in synchronism.

To bring the machine up to speed the generator field is strengthened by turning the hand wheel on the auxiliary control panel. To make paper successfully the relative speed of the various sections must not change—the motors must be synchronized and free from any individual change in speed. This is the function of the synchronous motors, and within their capacity they will absolutely hold the d-c. motors in step. The speeds of the different sections of the paper machine are not all the same as there is a slight increase from the wet end to the dry end, and this difference may vary slightly for different grades of paper and under different operating conditions. This variation is called "draw" and is taken care of by shifting the belt on the cones, a procedure which can only change the speed of the d-c. motor since the synchronous-motor speed is fixed.

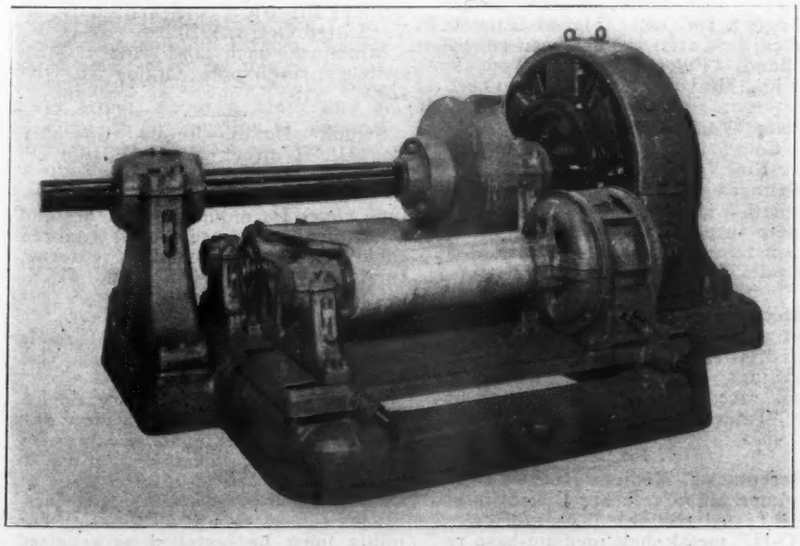
Under actual operation any change in the load on a particular section, caused by changing the weights or otherwise

Sectional Control Panel for Paper Machine.

altering conditions, will be absorbed by the synchronous machine. If the load increases it will act as a motor to aid the d-c. motor on that particular section, and will draw its power from the remaining synchronous machines which will immediately act as generators and distribute the load over the entire machine drive. If the load decreases it will act as a generator and supply power to the remaining synchronous machines which then act as motors. Any change in load on any section is therefore distributed over the whole motor equipment and may change the speed of the paper machine as a whole, but cannot cause any change in the relative speeds of the various sections.

So long as any synchronous machine operates within its capacity, either as a motor or as a generator, it will not be necessary to make any adjustments, but if the indicating wattmeter in the synchronous machine circuit shows too much power it may be easily brought back to zero by turning the rheostat in the field of the d-c. motor in the proper direction.

This equipment is what is termed hand-control equipment, but the term applies to the sectional panels and not to the main control panel since all adadjustments of power and transfer of energy between the d-c. motors and their corresponding synchronous motors is accomplished by hand. It is not considered essential to make this adjustment automatic, as the indicating wattmeter in the synchronous-motor circuit plainly shows whether the synchronous motor is acting as a motor or a generator and how much power it is delivering. As long as it is operating within the prescribed limits no adjustments are necessary. However, the automatic feature is readily obtainable by the addition of a motor-operated field rheostat for the d-c. motor, this rheostate being actuated by a contact-making wattmeter in the synchronous-motor line. This consists of an inclosing case containing the motor-operated rheostat, a contact-making wattmeter and the relay for operating the rheostat motor. The so-called automatic control has all of the features of the hand control if it is desirable to operate it as such for any reason.



Synchronous and D-C. Motors Connected Together for Paper-Mill Drive.

LATEST APPROVED APPLIANCES

Approved by Underwriters' Laboratories, Following Examination and Tests Conducted Under the Standards of the National Electrical Code

Attachment Plugs, Fuseless.—Cutler-Hammer Manufacturing Co., Milwaukee. Listed Oct. 13, 1920.

"C-H" fuseless attachment plugs; 660 watts, 250 volts; body only; catalog No. 7780; cord connector, catalog No. 7850.

Cigar Lighter.—The Duralectric Corp., Main and 4th streets, Jamestown, N. Y. Listed Nov. 12, 1920.

"Duralectric" cigar lighter, having a heating element connected to the low-voltage secondary of a transformer; 110 volts a-c., 60 cycles, 40 and 20 watts.

Conduit Boxes.—Appleton Electric Co., 212 North Jefferson street, Chicago. Listed Oct. 14, 1920.

Pressed-steel conduit-box covers with swivel-fixture attachment for ½-in. conduit, catalog No. 8435; wattmeter connection boxes, 0-30 amperes, Types PRA, PRB, MTA, MTC, MTL, MTR and MTT.

Conduit Boxes.—Cameron Overbagh Co., 221 West Randolph street, Chicago. Listed Oct. 19, 1920.

Catalog Nos. 307, 405-07; also with steel covers, with or without bushings.

Conduit Boxes.—Clemence Brothers, 164 Linden avenue, Irvington, N. J. Listed Oct. 12, 1920.

Sterling "J-M." castiron boxes for armored cables and flexible steel conduits.

Conduit Boxes.—Sprague Electric Works of General Electric Co., 527 West 34th street, New York City. Listed Oct. 19, 1920.

Pressed-steel conduit boxes for use with rigid conduit, flexible-steel conduit or armored cable; catalog Nos. 14241, 34461 and 48241.

Conduit Boxes, Fittings.—Cameron Overbagh Co., 221 West Randolph street, Chicago. Listed Oct. 19, 1920.

Covers for conduit boxes; catalog Nos. 312-15, 321-25 and 421-21.

Current Taps.—H. T. Paiste Co., 32nd and Arch streets, Philadelphia. Listed Nov. 5, 1920.

"Paiste" current taps, multiple type; keyless, 660 watts, 250 volts; catalog Nos. 1410-11 and 1460-61.

Cutout Bases, Cartridge-Fuse.—E. H. Freeman Electric Co., Trenton, N. J. Listed Nov. 5, 1920.

"Freeman" cartridge-fuse cutout bases; 0-60 amperes, 600 volts; catalog Nos. 460 and 461.

Cutout Bases, Plug-Fuse.—Gordon Electric Manufacturing Co., Waterville, Conn. Listed Nov. 5, 1920.

"Gordon" plug-fuse cutout bases; 0-30 amperes, 125 volts; catalog Nos. 2165, 2199, 2587 and 2965.

Fixture Fittings.—Electrical Dealers' Supply House, 162 WestRandolph street, Chicago. Listed Oct. 12, 1920.

Insulating supports for chain fixtures consisting of heavy fiber tube having chain terminal link or threaded connections for attachment to standard fixture parts; catalog Nos. 110 and 112.

Fixtures.—Erickson Electric Co., 6 Portland street, Boston. Listed Nov. 19, 1920.

Show window and showcase types; catalog Nos. 1-3, 9 and 10.

Fuses, Renewable Cartridge—Pierce Fuse Corp., 752 Main street, Buffalo, N. Y. Listed Oct. 29, 1920.

"Pierce" cartridge-inclosed fuses; 61-600 amperes, 250 volts.

Heating Appliances.—Landis Machine Co., 1515-27 North 25th street, St. Louis. Listed Nov. 9, 1920.

"Landis" electrically heated shoe-stitching machine; 184 watts, 110-220 volts; catalog No. 12.

Outlet Bushings.—Nicholson Electric Fittings Co., Wilkes-Barre, Pa. Listed Nov. 5, 1920.

Malleable-iron connector bushings for connecting armored cable or flexible conduit outlets; marked "N."

Outlet Plates.—Cameron Overbagh Co., 221 West Randolph street, Chicago. Listed Oct. 19, 1920.

Catalog Nos. 400-04.

Picture Machine Appliances, Arc Regulator.—E. E. Fulton Co., 3208 Carroll avenue, Chicago. Listed Nov. 19, 1920.

Arc controller consisting of a motor with switch and fuse, to be connected across carbons of hand-feed arc lamp, and a centrifugal device direct-connected to the motor, which operates through a rod extending to lamp, to feed carbons after arc has been started by hand; "Fulco Speedco," Type S; 1-12 hp., 110 volts.

Plate Warmers.—Prometheus Electric Co., 511 West 42nd street, New York City. Listed Nov. 19, 1920.

Standard when installed to provide ventilation and heat insulation acceptable to inspection department having jurisdiction; 3400 watts or less, 125-250 volts.

Raceway Fittings.—H. T. Paiste Co., 32nd and Arch streets, Philadelphia. Listed Nov. 5, 1920.

Fittings for use with "National" metal raceways; adapter for mounting "Taplets" base devices; catalog No. 4075.

Receptacles, Medium Base.—Cutler-Hammer Manufacturing Co., Milwaukee. Listed Oct. 13, 1920.

"C-H." metal shell medium-base receptacles; keyless, catalog Nos. 7592 and 7593; push-button, 660 watts, 250 volts; catalog No. 7591.

Receptacles, Medium Base.—E. H. Freeman Electric Co., Trenton, N. J. Listed Oct. 26, 1920.

Porcelain shell medium base receptacles; key, catalog Nos. 501B, 502B, 503B, 508B, 509B, 561B, 562B, 563B, 568B, 569B, 581B, 582B, 583B, 588B, 589B, 601B, 602B, 603B, 608B, 609B; keyless, catalog Nos. 521B, 522B, 523B, 528B and 529B.

Sockets, Medium Base.—E. H. Freeman Electric Co., Trenton, N. J. Listed Oct. 26, 1920.

"Freeman" porcelain shell; key, catalog Nos. 501C, 502C, 504C, 505C, 561C, 562C, 564C, 565C, 581C, 582C, 584C, 585C, 601C, 602C, 604C and 605C; keyless, catalog Nos. 521C, 522C, 524C and 525C.

Switches, Surface.—Bryant Electric Co., Bridgeport, Conn. Listed Sept. 28, 1920.

"Bryant" or "Perkins" surface switches; series multiple, 10 amperes, 250 volts and 20 amperes, 125 volts; catalog No. 2800.

Switches, Inclosed.—Wadsworth Electric Manufacturing Co., Covington, Ky. Listed Aug. 24, 1920.

"S S" standard 2- or 3-pole combination cutout switches inclosed in metal case and provided with handle for manual operation without opening case; catalog Nos. 202, 203, 252, 2532 and 2533.

Switches, Pendant.—General Electric Co., Schenectady, N. Y. Listed Sept. 21, 1920.

"G. E." single-pole pendent switches; push, catalog No. GE1301.

Switches, Push and Rotary Flush.—General Electric Co., Schenectady, N. Y. Listed Oct. 1, 1920.

Miniature push and rotary flush switches; single-pole, catalog No. GE-1299.

Switch Boxes.—Renim Specialty Co., 110 K street, South Boston 27, Mass. Listed Oct. 4, 1920.

"Renim" castiron single and gang-type boxes for mounting switches and attachment plug receptacles; armored cable and flexible conduit patterns; catalog Nos. 21SX-24SX and 41SX-44SX.

Wire Connectors.—R. A. Macbeth, 1424 Girard street, Los Angeles, Cal. Listed Oct. 8, 1920.

"Star;" solderless splicing device consisting of grooved brass piece and brass clamping screw and washers for tightening on conductors; for use in joining wires No. 12 B. & S. gage or smaller, where such joints are accessible for inspection at all times. (The joints must be installed as required for soldered joints.)

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Harlan Electric & Machine Co., Harlan, Ky., has changed its name to the Cumberland Machine Works.

Edison Lamp Works of General Electric Co., Harrison, N. J., plans to erect a four-story addition to its plant, 80 by 200 ft.

P. & M. Co., 80 East Jackson boulevard, Chicago, manufacturer of electric arresters, etc., has increased its capital stock from $100,000 to $500,000.

Line Material Co., South Milwaukee, Wis., manufacturer of telegraph and telephone transmission supplies, recently sustained a loss of $50,000 to its assembling plant.

Louisville Electric Manufacturing Co., 660 South Second street, Louisville, Ky., manufacturer of electrical machinery, plans to erect a one-story building, 60 by 150 ft.

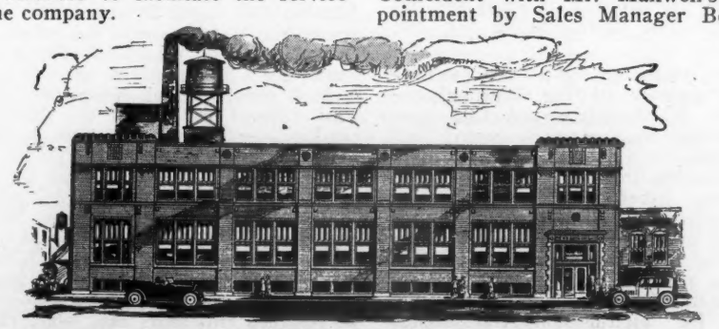
Chattanooga Armature Works, Chattanooga, Tenn., manufacturer of coils and commutators, etc., is distributing to the electrical trade an attractive calendar for 1921.

C. H. Leppert, Spruce and Asylum streets, Hartford, Conn., manufacturer of motors and parts, plans to erect a two-story plant, 41 by 65 ft., on Walnut street, at an estimated cost of $20,000.

Metal & Thermit Corp., 120 Broadway, New York City, has established a branch office at 141 Milk street, Boston, in charge of Robert L. Browne, New England district manager of the company.

Gold Seal Battery Co., Green Bay, Wis., is erecting a one-story building, 40 by 150 ft., at McDonald and James streets for the manufacture of batteries. The officers of the company are: President, E. J. Balza; vice-president, James D. Saley; secretary-treasurer, F. J. Mongin.

M. B. Austin Co., Chicago, manufacturer and distributor of the "Austin" line of conduit fittings, wiring devices, etc., recently moved to its new building at 108-116 South Desplaines street, about a block and a half from its old location at Jackson boulevard and Desplaines street. The new offices and warerooms are commodious and fitted up with modern conveniences to facilitate the service of the company.



New Building of M. B. Austin Co., Chicago.

Ideal Electric & Manufacturing Co., Mansfield, O., plans to erect a two-story plant and office building at an estimated cost of $40,000.

Bowen & Bartlett Co., 1201 South Sharp street, Baltimore, manufacturer of washing machines, has increased its capital to $200,000 for proposed extension of its manufacturing facilities.

Broad Manufacturing & Supply Co., Commonwealth building, Philadelphia, will engage in the manufacture of electrical and other equipment soon after Jan. 1. Frank A. Moorshead is interested in the enterprise.

Crown Electric Co., 164 North Gay street, Baltimore, manufacturer of electrical specialties, has purchased some property on High street for the construction of a building. George W. W. Wilkinson heads the company.

New Famous Chandelier Co., 1319 North American building, Philadelphia, plans to manufacture electric lighting fixtures and attachments within the near future. A. S. Ashbridge, Jr., is interested in the company.

American Ironing Machine Co., 168 North Michigan avenue, Chicago, has leased the plant of the Woodstock Worsted Knitting Co., Woodstock, Ont., and plans to equip the building next March, for the manufacture of the "Simplex" electric irons.

Brown-Hunkele Corp., 12 Mechanic street, Newark, N. J., manufacturer of motors, etc., will handle the sale of electrical and other machinery at the former plant of the International Arms & Fuse Co., Grove street, Bloomfield, N. J. This plant was recently acquired by the General Motors Corp., Detroit, and will be occupied by a number of its subsidiary organizations.

Crystal Washing Machine Division, Mallory Industries, Inc., with executive offices at Port Chester, N. Y., has announced the appointment of Robert D. Maxwell as district manager for the Middle West, with headquarters at Chicago. He was formerly connected with the Studebaker sales organization of southern California both as branch manager and as distributor. Coincident with Mr. Maxwell's appointment by Sales Manager Benjamin O. Willebrands, himself a veteran of the motor car industry, comes that of Charles Smith as Crystal district manager for the South, with headquarters at New Orleans, La. Mr. Smith until recently occupied a similar position with the Federal Motor Car Co. S. E. Sutherland, formerly with the Procter & Gamble Distributing Co., becomes Crystal district manager of the South Central states with headquarters at Cincinnati. A fourth addition to the Crystal sales organization is that of W. C. Sheehan, formerly production manager for the Locke Insulator Co., Victor and Lima, N. Y., who will be located at Port Chester, N. Y.

Air-Way Electric Appliance Corp., Toledo, O., has announced that in order to take care of its business more adequately it has opened a factory branch office at 20 East Jackson boulevard, Chicago, in charge of Leon Mayer, district sales manager. The company has appointed the National Electric Heating Co., Ltd., 546 Queen street, East, Toronto, Ont., as its exclusive factory distributor for Canada. Other appointments include A. L. Hixon as district sales manager for Michigan and Indiana, and Jay H. Maish as district sales manager for Ohio and Kentucky.

Holt Farm Light Co., Toledo, O., recently incorporated with a capital of $1,000,000, has taken over the Automatic Light Co. of Ludington, Mich., manufacturer of the Holt 110-volt direct current, without storage battery, farm light plant. The officers of the Holt company are: President, L. W. Holt; vice-president, S. H. Humphries; secretary-treasurer, H. K. Greenman; directors, A. E. Kowalk, Canton, O.; John E. O. Feller, Canton; W. W. Headings, Bellevue, O.; and George H. More, Jr., Fremont, O. The plant at Ludington will be continued until the company is able to secure a factory site in Toledo. Arrangements are being made in Toledo for about 50,000 sq. ft. of floor space in which to assemble the unit, the various component parts being manufactured at Ludington until it is possible to erect the complete unit in Toledo. L. W. Holt, president of the company, was president of the Automatic Light Co., Ludington, and formerly in the automobile business. He and Mr. Greenman, at one time a distributor for this particular farm-lighting plant at Minneapolis, purchased the business from Scott J. Matthews of Port Clinton, O., and conducted manufacturing operations at Ludington, Mich., where it was formerly known as the Alco plant, the name later being changed to the Holt Power Plant. Mr. Matthews will be associated with the Holt Farm Light Co. as consulting engineer, and George E. True, president of the American State Bank, Port Clinton, will be general counsel for the company.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

CLIFTON B. DAY has resigned as superintendent of the Northampton (Mass.) Electric Light Co., which position he has held for the past ten years.

GEORGE S. JONES, vice-president of the Guaranty Trust Co. of New York, has been elected a director of the Wagner Electric Manufacturing Co., St. Louis, to succeed the late James Bell.

JOHN L. GANZ, Union Electric Light & Power Co., St. Louis, spoke on the subject of "Advocacy of More Complete Electric-Wiring Installations" before a recent meeting of the St. Louis Electrical Board of Trade.

W. L. GRIFFITH, advertising manager of the National X-Ray Reflector Co., Chicago, was elected to the board of directors, Advertising Men's Post of the American Legion, at the annual election of that organization Dec. 6.

H. F. BRINCKERHOFF, who has been in charge of the Bluefield and Charleston offices of the Westinghouse Electric & Manufacturing Co., has been appointed manager of the supply division of the Philadelphia office of the company.

H. M. GANSMAN, formerly manager of the supply division, Philadelphia district office of the Westinghouse Electric & Manufacturing Co., has resigned to become general manager of the H. C. Roberts Electrical Supply Co., Philadelphia.

W. W. NICHOLS, Allis-Chalmers Manufacturing Co., addressed the members of the Academy of Political Science at the recent annual meeting of that body in New York City, his subject being "The Organization of an American Government Service for Trade Promotion and Information."

W. G. SCHMAUDER, superintendent of power of the Texas Power & Light Co., Dallas, Tex., has been promoted to assistant general manager, and has been succeeded in the former position by E. T. Keck. Mr. Schmauder is chairman of the safety committee of the Southwest Geographic Division, National Electric Light Association.

ROBERT L. ELTRINGHAM, electrical engineer for the State Industrial Accident Commission, San Francisco, has been appointed executive secretary of the California Electrical Co-operative Campaign to succeed Capt. H. W. Angus, who resigned recently to accept a commission as captain of infantry in the United States army. R. L. Smith, field representative for the campaign in the San Francisco bay district, and who had been acting secretary since the departure of Captain Angus, has also resigned to accept a commission as captain, corps of engineers, United States army, and a field representative has been added to the organization to take his place. Mr. Eltringham brings to the California Electrical Co-operative Campaign a wide experience in matters affecting the electrical industry and its relations with the public.

J. MAGIDSOHN, for many years in the engineering department of H. M. Byllesby & Co., Chicago, has joined the sales force of the bond department.

THOMAS S. PRENTICE, district commercial manager of the Southwestern Bell Telephone Co., Houston, Tex., died recently. He had been connected with the telephone industry for over 25 years.

WILLIAM STRANAHAN, formerly connected with the San Joaquin Light & Power Corp., Fresno, Cal., has accepted a position as Fresno county representative on the California State Irrigation Association Board.

BENJAMIN P. GEORGE, who was elected president of the Electrical Credit Association, Central Division, at the

B. P. George.

annual convention of that organization held in Chicago recently, is treasurer of the Beardslee Chandelier Manufacturing Co., Chicago, with which company he has been connected since 1908. He was elected a director six years ago and chosen treasurer in 1916. Mr. George has been a member of the executive board of the Electrical Credit Association for the past six years and has been national representative for five years.

STEPHEN Q. HAYES, switchboard engineer of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., gave illustrated lectures this week to several colleges in the East, his itinerary including Drexel Institute, Johns Hopkins University, Bliss Electrical School, Lehigh University and Penn State College. The object of the lectures was to give engineering students an idea of operating conditions of outdoor substation equipment for high-tension transmission lines.

C. SEMLER, of the Oklahoma Gas & Electric Co., Drumright, Okla., won the November prize offered to employes for making the largest number of sales of the company's preferred stock, while John Boyles, of the Enid division, won the prize for the largest number of individual sales.

FRANK THORNTON, JR., chief engineer of the Westinghouse Electric Products Co., has been appointed manager of the electric heating engineering department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Mr. Thornton was graduated from the University of Missouri in 1908, and spent a year studying in Europe. He joined the Westinghouse company in May, 1909, and after spending some time in the graduate students' course became engaged in engineering work on electric heating devices. He has followed this work continuously, broadening his activities from time to time. In 1918 the Westinghouse Electric Products Co. was located at Mansfield, O., and in February, 1919, Mr. Thornton was appointed chief engineer. In September, 1920, all of the engineering activities in connection with electric heating, including both appliances and industrial applications, were combined, and an engineering department organized with Mr. Thornton appointed as manager.

OBITUARY.

EDWARD BRIGGS died Dec. 10 at his home in Chicago. For many years he was connected with the engineering department of the H. M. Byllesby & Co. organization. Mr. Briggs, who was a regimental sergeant major during the war, was a prominent member of the Byllesby Post of the American Legion.

BENJAMIN F. HARRIS died at his home in Champaign, Ill., Dec. 19, aged 52 years. He formerly owned the Urbana & Campaign Railway, Gas & Electric Co., but some years ago disposed of his interests to William B. McKinley. Mr. Harris was president of the First National Bank of Commerce, served on the state council of defense during the war and was chairman of various committees of the Chamber of Commerce of the United States.

C. E. YOST died last month in Los Angeles, Cal., aged 79 years. He was one of the best known of the telephone pioneers in the West and for many years was president of the Northwestern group of Bell companies. Mr. Yost entered the service of the Nebraska Telephone Co. in 1889, becoming its president two years later. In 1898 he was elected president of the Iowa Telephone Co. and in 1907, when the Bell interests in Minnesota, North and South Dakota were combined with those in Iowa and Nebraska, he became president of the Northwestern group of the Bell companies, which position he resigned two years ago, being elected chairman of the board of directors.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Portland, Me.—The Cumberland County Power & Light Co. has disposed of its property on East Commercial street to W. L. Blake & Co., which will utilize the site for industrial operations.

Boston, Mass.—Electrical equipment, fixtures, etc., will be installed in the new plant addition to be erected by the Hersey Manufacturing Co., 314 West 2nd street, manufacturer of coolers and other kindred equipment, to be one-story, 50 by 100 ft., and estimated to cost about $25,000.

East Lee, Mass.—C. Wurtzbach and associates are planning the erection of a hydroelectric power plant on the Housatonic river, near East Lee.

Newburyport, Mass.—The Newburyport Gas & Electric Co. has made application to the Department of Public Utilities for permission to issue bonds for $850,000, to be used for financing, expansion, etc. Arthur W. Wood is president.

Oxford, Mass.—Electric equipment, refrigerating and cold storage apparatus will be installed in the proposed new cold storage plant to be built at Oxford by A. G. Stanhope, 340 Main street, Worcester. The plant is estimated to cost about $40,000; ground will be broken in the spring.

Pittsfield, Mass.—The Pittsfield Electric Co. has plans under way for the erection of an addition to its electric power plant to cost about $125,000. The Department of Public Utilities recently granted permission to the company to issue bonds for this amount for the improvement.

New Britain, Conn.—The power house at the woodworking plant of John Pinches & Son, 67 Church street, was damaged by fire Dec. 11.

New Haven, Conn.—The United Illuminating Co., 128 Temple street, has awarded the masonry contract for the addition to its power house on Grand avenue, 65 by 80 ft., to C. W. Murdock, Inc., 505 Grand avenue. The extension will cost about $60,000. James R. English is president.

Binghamton, N. Y.—The Binghamton Light, Heat & Power Co. has commenced the installation of new transformer equipment at its Johnson City station. The new transformer bank will provide for increased load. The company is also making improvements in the boiler department at this station.

Brooklyn, N. Y.—J. L. Hopkins & Co., 477 Keap street, are taking bids for the erection of a one-story addition to the power house at their drug works, to be 34 by 45 ft.

Brooklyn, N. Y.—The Kings County Lighting Co., 4802 New Utrecht avenue, has been granted permission by the Public Service Commission to issue preferred stock to an amount of $2,000,000, the proceeds to be used for plant and system extensions and improvements. Ralph Elsman is president.

Burdett, N. Y.—The Village Commission has been granted permission by the Public Service Commission to install and operate a municipal electric plant, securing power from the electric company operating at Watkins, over a transmission line extending to Hector, N. Y.

Glens Falls, N. Y.—The Parklap Construction Co. of New York City has a contract for the construction of a hydroelectric plant and dam at Sherman Island, Glens Falls.

Johnson City, N. Y.—The city council has construction under way on a new electrically operated pumping station to be used for the waterworks system. Service will be furnished by the Binghamton Light, Heat & Power Co. The municipality is using central station service exclusively for the operation of all departments of the city waterworks.

New York, N. Y.—John H. Delaney, Transit Construction Commissioner, has made application to the board of estimate for a city bond issue of $25,901,000, the proceeds to be used to carry on the construction of the municipal rapid transit lines during 1921, including the installation of electrical and mechanical equipment.

New York, N. Y.—The Consolidated Ship Building Co., 177th street, Morris Heights, has filed plans for the construction of a new power house at its works, 35 by 35 ft.

New York, N. Y.—The United Electric Light & Power Co., 130 East 15th street, plans the erection of a three-story substation at 115 West 27th street, to cost about $170,000.

Utica, N. Y.—Electrical and mechanical equipment will be installed in the new building to be erected at the plant of the Utica Valve & Fixture Co., Hubbell and Catherine streets, to replace the plant structure recently destroyed by fire with loss estimated at $50,000. George H. Harris is head.

Atlantic City, N. J.—The Atlantic City Tire & Rubber Co., 206 Humphreys building, of which A. L. Pearce is president, will construct an electric power house in connection with its proposed new automobile tire manufacturing plant at Virginia and Mediterranean avenues, two-story, 60 by 120 ft., and estimated to cost about $80,000. Samuel Headley, Guarantee Trust building, has the building contract.

Bayonne, N. J.—The Safety Insulated Wire & Cable Co., Avenue A, has filed plans for the erection of a one story brick addition with improvements in an existing building.

Belvidere, N. J.—W. C. Albertson and S. L. Mershon have organized a company to construct a new electric power plant in the vicinity of Foul Rift, on the Delaware river, with transmission lines to different points in this section. Fort, Hunt & Shipman, 31 Clinton street, Newark, N. J., attorneys, are interested in the project.

Bloomfield, N. J.—Scott & Bowne, 80 Orange street, have plans under way for the erection of a new power plant at their local cod-liver oil factory. An addition to the plant will also be constructed, the entire work being estimated to cost about $80,000.

Dover, N. J.—The New Jersey Power & Light Co. has completed the construction of a new three-phase power line from its Mount Arlington substation to Succasunna and Kenvil, N. J., for power service at these places. A new transmission line has also been completed to the properties of the North Jersey Steel Co., at Beach Glen.

Harrison, N. J.—The Edison Lamp Works of the General Electric Co. is having revised plans prepared for the construction of its proposed new four-story addition, 80 by 200 ft., on South street. John H. and Wilson C. Ely, Firemen's building, Newark, are architects.

Jersey City, N. J.—The Wateree Electric Co., a New Jersey corporation, has filed notice of increase in capital from $7,500,000 to $30,000,000.

Long Branch, N. J.—The Board of Commissioners is arranging for the installation of a new garbage incinerating plant, to be equipped with electrical machinery. The plant is estimated to cost about $80,000. Clarence J. Housman is mayor.

New Brunswick, N. J.—Electrical and mechanical equipment, motors and refrigerating apparatus will be installed in the new plant to be erected by the Arctic Ice Co., 56 French street. It will be three-story, 50 by 100 ft., and is estimated to cost about $75,000.

Pennington, N. J.—The Board of Directors, Pennington Seminary, has had plans prepared for the erection of a new power house, in connection with a mechanical laundry plant at the institution. H. W. Caster, Stephen Girard building, Philadelphia, Pa., is architect.

Ridgefield, N. J.—Electrical equipment, motors, etc., will be installed in the new two-story plant to be constructed at Grand avenue and Hall street by the Continental Folding Paper Box Co., 122 Washington avenue, Brooklyn. The factory will be two-story, 100 by 250 ft.

Trenton, N. J.—Thomas & Betts, Inc., 63 Vesey street, New York, electrical contractor, a New Jersey corporation, has increased its capital from $300,000 to $600,000.

Allentown, Pa.—An explosion at the plant of the United Gas Improve-

ment Co., Dec. 11, caused a damage of about $15,000. The loss will be replaced at once.

Chester, Pa.—The Tilghman power plant of the Philadelphia & Suburban Gas & Electric Co., Philadelphia, was damaged by fire on Dec. 6.

Donora, Pa.—The American Steel & Wire Co. has had plans prepared for the erection of a new one-story power house at its local works.

Erie, Pa.—The Burke Electric Co., Twelfth and Cranberry street, manufacturer of motors, etc., has had plans prepared for the erection of a one-story addition to its plant, 37 by 110 ft., to cost about $28,000.

Harrisburg, Pa. — The Harrisburg Light & Power Co. has commenced the erection of a one-story addition, 37 by 100 ft., to its power house on Cedar street.

Oil City, Pa.—A breakdown at the plant of the Citizens' Light & Power Co. caused an interruption in service on Dec. 13. Repairs will be made in the plant and necessary improvements provided.

Philadelphia, Pa.—The Department of City Transit, 1211 Chestnut street, will call for bids at once for 50 electrically-operated cars, to be used on the Frankford elevated railway line. William S. Twining is director.

Philadelphia, Pa.—The Standard Engineering Co., Thirtieth street, near Race street, has filed plans for the erection of a new one-story power house, 24 by 35 by 60 ft.

Philadelphia, Pa. — The Thomas Potter's Sons Co., Second and Erie streets, has taken out a permit to build an addition to the power house at its linoleum works.

Reading, Pa. — The Metropolitan Edison Co. has arranged for a bond issue of $100,000, the proceeds to be used for plant extensions and betterments.

Reading, Pa.—The Topton Electric Light & Power Co. has increased its rates 2 cents per kw-hr., effective Dec. 31, for all classes of service, including street lighting in the different communities served.

Ridgeway, Pa.—The Keystone Electric Service Corp. has filed application with the Public Service Commission for permission to merge ten companies in the Elk County district into one company of the name noted.

Scranton, Pa.—The Scranton Coal Co. has plans under way for the rebuilding of its power house and coal washery at Peckville, known as the Raymond Colliery, destroyed by fire Dec. 13 with loss estimated at about $250,000, including machinery.

Annapolis, Md.—The Bureau of Yards & Docks, Washington, D. C., has taken bids for the erection of a new power house and equipment at the local naval station.

Baltimore, Md.—The Ashburton Heating Co. has filed plans for the erection of a new one-story power house for general heating service at Ashburton avenue and the Western Maryland railroad line.

Baltimore, Md. — The Superintendent of Lamps and Lighting, Room 209 City Hall, will receive bids until 11 a. m., Jan. 5, for a number of plain and ornamental iron lamp posts and standards, for installation in different parts of the city. John J. Hanson is superintendent of lamps and lighting.

Baltimore, Md.—The Washington, Baltimore & Annapolis Electric Railway Co. has taken title to property at Eutaw and Plum streets, to be used in connection with its local operations.

Clarksville, Va.—The Roanoke River Development Co., Richmond, Va., has plans under way for the erection of a new hydroelectric power plant on the Roanoke river at Buggs Island, near Clarksville.

Portsmouth, Va.—The City Commission has plans under way for the installation of a municipal electric plant. J. P. Jervey is city manager.

Roanoke, Va. — The Norfolk & Western Railroad Co. has completed plans for the erection of its proposed new power plant at Radford, Va., to be about 60 by 90 ft.

Clarksburg, W. Va.—The Monongahela Valley Traction Co. is planning for the erection of a new local substation, to be used in connection with the extension of its transmission lines from Hutchinson to Clarksburg. The line will operate at 66,000 volts.

Grafton, W. Va.—The city council has plans under way for extensions and improvements in the local street-lighting system to cost about $12,000. S. T. Scanlon is engineer.

Martinsburg, W. Va.—The Interwoven Mills, Inc., has construction under way on a new local power plant, to be used in connection with its knitting mills in this section. The new station is estimated to cost about $100,000, including machinery. Headquarters of the company are at New Brunswick, N. J.

Martinsburg, W. Va.—The Potomac Light & Power Co. has plans under way for the rebuilding of the switchboard department at its local plant, recently destroyed by fire with loss estimated at about $20,000.

Greenville, N. C.—Citizens have approved a bond issue of $65,000 for the installation of electric lighting equipment, in connection with waterworks improvements.

Morganton, N. C. — The Catawba Valley Light & Power Co. is planning for the erection of a new hydroelectric power plant on Wilson creek, near Lenoir.

Raleigh, N. C.—The Raleigh Telephone Co. has plans under way for the immediate rebuilding of its local exchange station, including switchboard, recently damaged by fire.

Manchester, Ga.—The city council has approved a bond issue of $50,000 to be used for the installation of a municipal electric power plant.

NORTH CENTRAL STATES.

Cincinnati, O.—The installation of a fourth generating unit is being contemplated by the Cincinnati Gas & Electric Co., 114 West 6th street, of which C. D. Jones is president.

Lima, O.—Bonds in the sum of $180,000 have been authorized for the installation of a boulevard lighting system. Light posts will be erected at intervals of from 50 to 75 ft. around each of 25 blocks in the heart of the city. Lights will also be installed at intervals of 100 ft. on Market street from Miller avenue to Cole street, and on Main street from the Erie railroad to Haller street.

Grand Ledge, Mich.—The Consumers Power Co. is contemplating building one or two dams during the coming season, either on the Manistee river or the Au Sable.

Grand Rapids, Mich.—The Prairie River Power Co. will build two reservoir dams; one at the foot of Balsam lake, and one at the foot of Wolf lake.

Kalamazoo, Mich.—A program to extend the street lighting system has been compiled by City Manager Harry Freeman and will be presented to the city commission.

Kinde, Mich.—The Central Lighting & Power Co., Bad Axe, has plans under way to provide this village with electrical service.

Reading, Mich.—The power house of the Acme Chair Co. was destroyed by fire recently. The loss is estimated at $150,000, including equipment.

Crown Point, Ind.—The board of directors of Crown Point hospital plans to construct a two-story power plant, 50 by 50 ft. J. N. Coleman, 6257 St. Lawrence avenue, Chicago, is the architect.

Decatur, Ind.—The city clerk will call for bids soon after Jan. 1 for the construction of a municipal power plant.

Michigan City, Ind.—The Haskell & Barker Car Co. plans to erect a one-story power plant and foundry addition at an estimated cost of $80,000. Frank D. Chase, Inc., 845 North Michigan avenue, Chicago, is the architect.

Mattoon, Ill.—Mayor Clona has informed the council that he has under contemplation the installation of a boulevard lighting system for the city, but that the city must own and operate its own electric light plant, before such a system can be brought about.

Prentice, Ill.—The town will install an electric lighting system, electrical power for which will be generated at Petersburg and furnished residents along the line as well as Prentice patrons.

Oshkosh, Wis.—Bids will be received for an ornamental street lighting system to cost about $75,000. Wm. F. Porath is chairman of Board of Public Works.

Peshtigo, Wis.—The Northern Pulp & Paper Co. plans to erect a power plant at Lakewood, Marinette county, in connection with its new pulp mill. The power equipment will include two 850-hp. turbines and governors. Address A. A. Pamperin, general manager, Peshtigo.

Duluth, Minn.—The city will install street lights on Vermillion road between Lewis and Kenilworth avenues. Bert Farrell, commissioner of public works, is in charge.

Grand Rapids, Minn.—The Grand Marais Light & Power Co. has been organized with a capital of $25,000. Charles V. McCoy, 1819 Wallace avenue, Duluth, is interested.

Kiester, Minn.—A special election will be held to decide on building an electric light plant. G. M. Olenmeyer is city clerk.

Milaca, Minn.—W. E. Skinner, engineer, 3241 Aldrich avenue, south, has prepared plans for changing the elec-

tric service from direct to alternating current. Additional unit and new generator will be installed.

Owatonna, Minn.—The question of issuing $475,000 in bonds for the erection of a municipal light, power, gas and heating plant will be voted on Jan. 10th.

Rosewood, Minn.—The commission will install an electric lighting system at this place. A. S. Holm is one of the members of the commission.

Sauk Center, Minn.—For the purpose of improving the present lighting system, an election will be held to vote on a $15,000 bond issue. J. F. Cooper is city clerk.

Bouton, Ia.—The People's Electric Light & Power Co. has been organized with a capital of $20,000 for the purpose of supplying electrical energy from the high tension line, to the stockholders of this corporation. B. Kleckner is president.

Conrad, Ia.—The Conrad Commercial club is making plans for the installation of a street lighting system at this place.

Kansas City, Mo.—A contract has been let for the installation of a "white way" on Baltimore avenue from 12th street to Southwest boulevard. Alderman Joseph A. Boppart will supervise the arrangements.

St. Joseph, Mo.—The members of the city council and W. K. Seitz, city engineer, are investigating the possibilities of securing electric current from Kansas City for light and power here. The cost of a line direct to St. Joseph is estimated at $500,000. Ernest M. Lindsay is president of the council.

St. Louis, Mo.—Bids will be received Jan. 1 by the Chester Iron & Foundry Co., 7000 Vulcan street, of which E. A. Linnis is secretary, for the erection of a foundry and power plant. The cost is estimated at $30,000. L. Haeger is architect.

Milford, Neb.—An ornamental street lighting system will be installed in the North Thirteenth boulevard district. R. M. Sneckenberger is city engineer.

Milford, Neb.—Koenig, Hollister & Co., engineers, 401 Bankers' Life building, Lincoln, have prepared plans for additions and improvements to the hydroelectric plant of the Nebraska Corn Mills.

Oldham. S. D.—At a special election, bonds in the sum of $25,000 were voted for improving the electric lighting system.

SOUTH CENTRAL STATES.

Carrollton, Ky.—Bids will be received Dec. 20 for improvements to the electric power plant and water works. The cost is estimated at $12,000.

Millington, Tenn.—Bonds in the sum of $20,000 have been authorized for the erection of an electric light and power plant.

Tuscaloosa, Ala.—The Alabama Home for the Feeble-Minded is preparing plans for a power house. Address C. B. Verner, chairman of the building committee.

Jackson, Miss.—The erection of a power house at the sanitarium here is being contemplated by the Mississippi State Board of Health. B. Price, 1420 Jefferson Bank building, Birmingham, Ala., is architect.

Little Rock, Ark.—The Arkansas Hydroelectric Developing Co. has increased its capital stock to $3,000,000 and will build two dams on the Little Red river.

Bonham, Tex.—An election will be held to vote on the question of a bond issue for the erection of a municipal light and power plant. The mayor is in charge.

Dallas, Tex.—The Dallas Power & Light Co. will expend $175,000 for improvements to its plant. E. W. Davis is general manager.

Fort Worth, Tex.—The Fort Worth Light & Power Co. contemplates enlarging its plant.

Jewett, Tex.—The Jewett Electric light plant owned by J. A. Darn and W. N. Martin was recently damaged by fire, will be rebuilt at once.

Pecos, Tex.—The Pecos Power & Ice Co. has been incorporated with a capital of $50,000. The incorporators are J. W. Crowdus, M. E. Neiderkorn and M. E. Crowdus, all of Texas.

Sweetwater, Tex.—At a joint meeting of the city council and business men of Sweetwater it was decided to build a municipal electric light and power plant. Bonds will be issued for this purpose.

WESTERN STATES.

Salt Lake City, Utah.—Bids will be received Dec. 28 for furnishing and erecting 6.6 ampere arc lamps and ornamental castings over present trolley poles in lighting district No. 6, State street, South Temple to Fourth South street.

Spokane, Wash.—R. R. McCabe has filed an application for a franchise for a pole line to supply heat and power along the Charman road and the Sunset Poultry Farms.

Spokane, Wash.—The Washington Water Power Co. is planning to develop a hydraulic electric plant with a capacity of 14,000 hp. on the Spokane river between Howard and Washington streets. Work on the plant will start this winter, so as to have the plant in readiness by next fall. D. L. Huntington is president.

Portland, Ore.—Bids will be received for lighting the streets, public places and municipal buildings of the city. The city council is now authorized to enter into contracts for street lighting for five years. The contract for street lighting is now held by the Portland Railway Light & Power Co.

Georgetown, Cal.—The installation of an electric lighting system is being contemplated by the city officials. G. G. DeVore is in charge.

Oroville, Cal.—The Great Western Power Co., 14 Sansome street, San Francisco, will soon start work on the construction of a hydroelectric plant, to cost about $6,000,000.

Pasadena, Cal.—Plans are being made by the city water department to install electrical equipment in the steam plant at the Copelin wells.

San Bernardino, Cal.—An electric power plant will be erected by Riverside, Redlands and San Bernardino. G. S. Hinckley of Redlands, city engineer, will prepare the plans.

San Francisco, Cal.—The Federal Telegraph Co., Hobart building, plans to erect four wireless plants at an estimated cost of $500,000. The stations will be located in the vicinity of Portland, Ore., San Diego, Palo Alto and Los Angeles, Cal.

INCORPORATIONS.

Newark, N. J.—Efficient Electric Protection Co. Capital, $50,000. To manufacture electrical products. Incorporators: Harry Dvorken, 86 Jefferson street, Frank Silken and others.

New York, N. Y.—Bilt-Well Lighting Fixture Co. Capital, $25,000. To manufacture electrical fixtures, etc. Incorporators: H. J. Glassberg, 87 Manhattan street, J. Glassberg and others.

New Haven, Conn.—New England Electrical Appliance Co. Capital, $25,000. To manufacture electrical supplies. Incorporators: Jacob Kaczer, F. and A. I. Lapides, 19 Cottage street.

Rochester, N. Y.—Ogden R. Adams Co. Capital, $125,000. To manufacture electrical and mechanical machinery. Incorporators: C. E. Kinney, I. E. Mason, and O. R. Adams, Rochester.

Yonkers, N. Y.—Westchester Electric Appliance Co. Capital, $10,000. To manufacture electrical supplies and equipment. Incorporators: G. W. Dewitt, R. N. Lindgren and G. Robins, Yonkers.

New York, N. Y. — Quincy & Schroeder. Capital, $55,000. To manufacture electrical motors and parts. Incorporators: R. B. Quincy, J. R. Courtney and E. C. Schroeder, 62 East 34th street.

Greenville, N. C.—Greenville Storage Battery Co. Capital, $50,000. To manufacture storage batteries and other electrical equipment. Incorporators: J. K. Proctor, W. G. Downing, W. T. Bryan and others.

East Orange, N. J.—Tiffany Electric Co. Capital, $30,000. To manufacture electrical specialties. Incorporators: Harold Brangs, Walter A. Morton, E. H. Tiffany, 422 North Walnut street, and others.

Newark, N. J.—F. H. Allen & Co. Capital, $125,000. To manufacture electrically operated elevators and parts. Incorporators: Franklin H. Allen, East Orange; John W. Beck and James H. Ward, Jr., Newark.

Toronto, Ont.—All-Weld Co., Ltd. Capital, $40,000. To manufacture electric welding machines, etc. Incorporators: George E. Fax, 122 Laughton avenue, Toronto, Can.; James E. Ferguson, F. W. Allen and others.

New York, N. Y.—Beregh Manufacturing Corp. Capital, $20,000. To engage as electrical engineers and manufacture electrical products. Incorporators: J. J. Donovan, F. W. Saltzsieder and T. J. Beregh, 461 Eighth avenue.

Lewisburg, W. Va.—J. C. Boggs Motor & Light Co. Capital, $50,000. To manufacture electrical motors and lighting equipment. Incorporators: W. A. Charleston, Hinton, W. Va.; J. C. Boggs and John A. Littlepage, Lewisburg.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Tennessee Railway, Light & Power Co. and Subsidiaries.

	1920.	1919.
October gross	$ 558,248	$ 467,507
Net after taxes	153,997	141,243
Surplus after charges	25,084	12,478
Twelve months' gross	6,319,519	5,593,495
Net after taxes	2,138,678	2,106,488
Surplus after charges	598,788	580,534

United Light & Railways Co. and Subsidiaries.

The earnings statement of the United Light & Railways Co. and its subsidiaries for the 12 months ended Sept. 30, 1920, is as follows:

	1920.	1919.
Gross earnings	$11,645,579	$9,846,412
Net after taxes	3,251,968	2,898,652
Surplus after fixed charges	1,414,405	1,116,212
Surplus after preferred dividends	811,141	510,248

Arkansas Valley Railway Light & Power Co.

The net earnings of the Arkansas Valley Railway Light & Power Co. for the year ended Oct. 31 were $599,366, an increase of 9.8% over the previous twelve months' period, and an increase of $7238 over the net for the year ended Sept. 30. October gross and net comparative figures are as follows:

	1920.	1919.
October gross earnings	$ 162,407	$ 131,273
Net earnings	51,288	44,051
Twelve months' ended Oct. 31—		
Gross earnings	1,817,386	1,534,530
Net earnings	599,366	545,828

Cumberland County Power & Light Co.

	1920.	1919.
September gross	$ 270,660	$ 250,318
Net after taxes	96,306	95,391
Surplus after charges	40,544	39,780
Twelve months' gross	3,042,703	2,836,763
Net after taxes	1,040,596	833,871
Surplus after charges	373,238	113,066

United Gas & Electric Corp.

	1920.	1919.
October gross	$1,062,502	$ 900,858
Net after taxes	289,219	324,120
Total income	291,269	326,562
Surplus after fixed charges	131,098	173,217
Twelve months' gross	12,015,988	10,115,002
Net after taxes	3,925,261	3,432,881
Total income	3,973,275	3,465,492
Surplus after fixed charges	2,077,401	1,835,834

Metropolitan Edison Co.

	1920.	1919.
October gross	$ 273,474	$ 206,666
Net after taxes	68,191	69,414

Nevada-California Electric Corp.

	1920.	1919
September gross	$ 291,191	$ 230,412
Net after taxes	173,708	126,600
Total income	172,729	126,199
Surplus after charges	89,649	46,494
Nine months' gross	2,377,552	1,990,746
Net after taxes	1,254,265	1,107 379
Total income	1,247,971	1,105.737
Surplus after charges	566,322	444,109

Great Western Power System.

	1920.	1919.
October gross	$ 570,379	$ 420,450
Net after taxes	309,068	245,339
Surplus after fixed charges	133,041	98,158
Twelve months' gross	6,210,118	5,224,303
Net after taxes	3,381,679	3,055,230
Surplus after fixed charges	1,475,796	1,439,350

Republic Railway & Light Co. and Subsidiaries.

	1920.	1919.
October gross	$ 730,761	$ 497,446
Net after taxes	124,544	105,869
Total income	140,721	126,633
Surplus after charges	18,348	12,183
Twelve months' gross	8,018,965	5,992,578
Net after taxes	1,739,985	1,424,332
Total income	1,938,141	1,698,414
Surplus after charges	484,524	335,867

Consumers Power Co. and Michigan Light Co.

	1920.	1919.
October gross	$1,242,914	$1,016,947
Net earnings	458,452	413,270
Surplus after fixed charges	220,108	208,061
Balance after preferred dividends	153,677	143,788
Ten months' gross	11,554,366	9,161,805
Net earnings	4,006,121	4,000,910
Surplus after fixed charges	1,572,605	1,881,458
Balance after preferred dividends	924,533	1,239,424

Pennsylvania Utilities System.

	1920.	1919.
October gross	$ 217,471	$ 169,204
Net after taxes	56,502	48,840

General Gas & Electric Co. Subsidiaries.

	1920.	1919.
October gross	$1,046,019	$ 834,083
Net after taxes	204,929	233,704
Twelve months' gross	10,935,202	8,875,430
Net after taxes	2,383,020	2,610,462

Galveston-Houston Electric Co.

	1920.	1919.
October gross	$ 353,234	$ 254,514
Net earnings	115,486	51,792
Surplus after charges	80,214	16,633
Twelve months' gross	3,670,494	3,054,664
Net earnings	1,063,328	820,278
Surplus after charges	641,279	416,836

Commonwealth Power, Railway & Light Co.

	1920.	1919.
October gross	$2,702,796	$2,289,807
Net after taxes	862,809	913,113
Surplus after fixed charges	117,639	218,878
Balance after preferred dividends	27,874	129,113
Ten months' gross	25,535,042	20,929,618
Net after taxes	8,576,345	8,586,629
Surplus after fixed charges	1,267,570	1,777,246
Balance after preferred dividends	369,920	879,596

Fixed charges includes dividends on outstanding preferred stock of constituent companies in addition to taxes and interest.

Puget Sound Power & Light Co.

	1920.	1919.
October gross	$ 881,636	$ 772,894
Net earnings	388,866	279,673
Surplus after charges	228,885	131,964

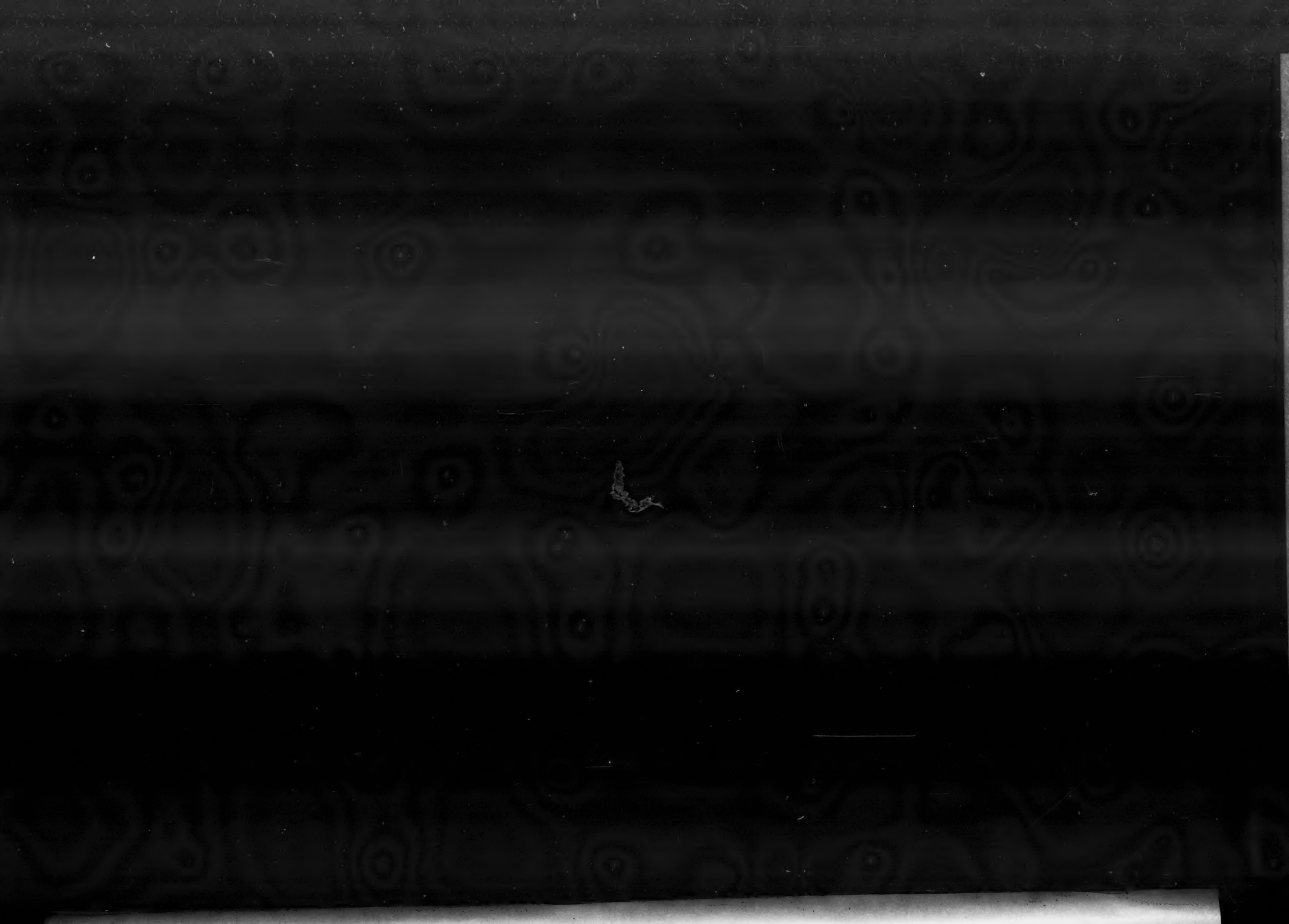
Dividends.

	Term.	Rate.	Payable.
Am. Gas & El. com.	Q.	2.50%	Jan. 2
Am. Gas & El. com.	Stk.	2%	Jan. 2
Am. Gas & El. pf.	Q.	1.50%	Feb. 1
Am. Pr. & Lt. pf.	Q.	1.50%	Jan. 3
Ash. Pr. & Lt. pf.	Q.	1.75%	Jan. 3
Carol. Pr. & Lt. pf.	Q.	1.75%	Jan. 3
Cities Serv. com.	Mo.	.50%	Feb. 1
Cities Serv. com.	Stk.	1.25%	Feb. 1
Cities Serv. pf.	Mo.	.50%	Feb. 1
Cities Serv. pf. "B"	Mo.	.50%	Feb. 1
Colum. El. pf.	S.A.	$3.00	Jan. 3
Det. Edison	Q.	2%	Jan. 15
Duquesne Lt. pf.	Q.	1.75%	Feb. 1
E. Tex. El. com.	Q.	$2.00	Jan. 3
E. Tex. El. pf.	S.A.	$3.00	Jan. 3
El Paso El.	S.A.	3%	Jan. 10
Kan. Gas & El. pf.	Q.	1.75%	Jan. 3
Kaministiquia Pr.	Stk.	13.50%	Dec. 23
Monongahela V. Tr. pf.	Q.	37.05c	Jan. 8
Northwestern Pr. pf.	S.A.	3%	Jan. 1
Pa. Cent. Lt. & Pr. pf.	Q.	80c	Jan. 1
Utah Pr. & Lt. pf.	Q.	1.75%	Jan. 3
West Penn. Pr. pf.	Q.	1.75%	Feb. 1
W. Penn. Tr. & W. Pr. pf.	Q.	1.50%	Feb. 15

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Dec.14.	Bid Dec. 21.
Adirondack Electric Power of Glens Falls, common	6	11	11
Adirondack Electric Power of Glens Falls, preferred	6	72	70
American Gas & Electric of New York, common	..	96	93
American Gas & Electric of New York, preferred	6	34	32
American Light & Traction of New York, common	..	105	90
American Light & Traction of New York, preferred	6	77	76
American Power & Light of New York, common	4	46	45
American Power & Light of New York, preferred	6	60	58
American Public Utilities of Grand Rapids, common	..	6	6
American Public Utilities of Grand Rapids, preferred	7	17	18
American Telephone & Telegraph of New York	..	98	96
American Water Works & Elec. of New York, common	..	1½	1
American Water Works & Elec. of New York, particip	7	5	4
American Water Works & Elec. of New York, 1st preferred	..	38	36
Appalachian Power, common	..	2	2
Appalachian Power, preferred	7	16	18
Cities Service of New York, common	+extra	258	250
Cities Service of New York, preferred	6	63½	63
Commonwealth Edison of Chicago	8	100	101
Comm. Power, Railway & Light of Jackson, common	..	9	4
Comm. Power, Railway & Light of Jackson, preferred	6	32	31
Federal Light & Traction of New York, common	..	5½	5
Federal Light & Traction of New York, preferred	..	45	43
Northern States Power of Chicago, common	..	38	34
Northern States Power of Chicago, preferred	ex.div.7	75	75
Pacific Gas & Electric of San Francisco, common	..	47	45
Public Service of Northern Illinois, Chicago, common	7	60	58
Public Service of Northern Illinois, Chicago, preferred	6	79	78
Standard Gas & Electric of Chicago, common	..	10	9
Standard Gas & Electric of Chicago, preferred	8	32	30
Tennessee Railway, Light & Power of Chattanooga, common	..	½	½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	2	1½
Western Power of San Francisco, common	..	19	18
Western Union Telegraph of New York	extra	86	83
Industrials—			
Electric Storage Battery of Philadelphia, common	4	97	98
General Electric of Schenectady	8	120	118
Westinghouse Electric & Mfg. of Pittsburgh, common	7	42	42



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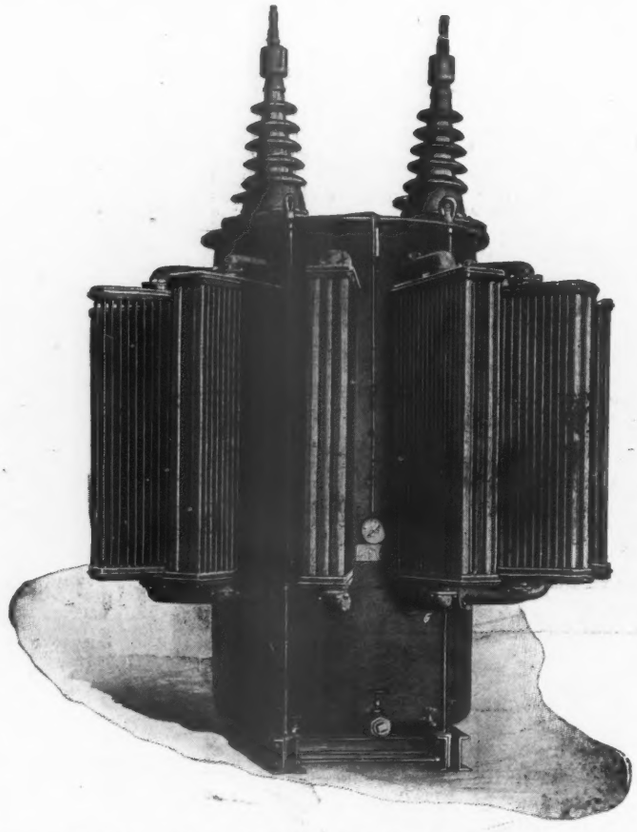

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The Time for Doing, Not Whining

So many American business men are discouraged by present conditions that it is important for practical optimists to give them as much mental stimulus as possible. This is the time for every brain and hand to utilize every atom of energy, every constructive thought, every helpful suggestion that will furnish more power to the business motor.

This is the time when the generals of business must take off their coats, roll up their sleeves and put new vigor into every department.

This is the time when raw material men must join forces with manufacturers to keep up production.

This is the time when manufacturers must co-ordinate their interests with jobbers and other large distributors in a will to win by working together.

This is the time when jobbers must co-operate to the fullest extent with contractors, supply houses and dealers by the suggestion of better selling methods. Showing a dealer how to sell more is to show him how to buy more.

This is the time when entire sales organizations should be on the road selling prosperity, and star salesmen should not ignore one-night stands. Beating the brush for business is more profitable than killing time at home.

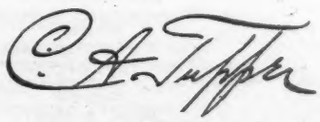
This is the time when retailers must take advantage of every legitimate means of inducing business by catering to the public needs at reasonable prices for dependable goods. Business may be encouraged when it cannot be forced.

This is the time for salesmen and delivery departments to remember that truth, courtesy and smiling service are the three great assets of personal success.

Inertia begets inertia; every complaint breeds others.

This is the time when the business whiner should be ostracized, the grouch banished, the discouraged inspired.

Super-effort in the office, factory, on the road, behind the counter, will do more to blow away the clouds of uncertainty and put business on a soundly economic and profitable basis than all the theories or appeals for governmental assistance that ever have been or ever will be promulgated.



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50612

The Best Made Motor

Trouble-Proof—The Motor She Knows

**A good motor enchances
the value of the appliance
it drives.**

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.
Sales Offices In All Large American Cities

Westinghouse

ECONOMY *renewable* FUSES

THE prevention of damage to machinery and the proper protection of lives and property in industrial plants using electrical energy for power and light purposes are best accomplished through the installation of Economy Renewable Fuses in all circuits.

The famous Economy "Drop Out" Renewal Links constantly operate at rated capacities. Their use enables a saving of 80% annually in fuse maintenance costs as compared with the use of "one-time" fuses.

Your plant needs Economy Fuses. Tell your electrician to install them.

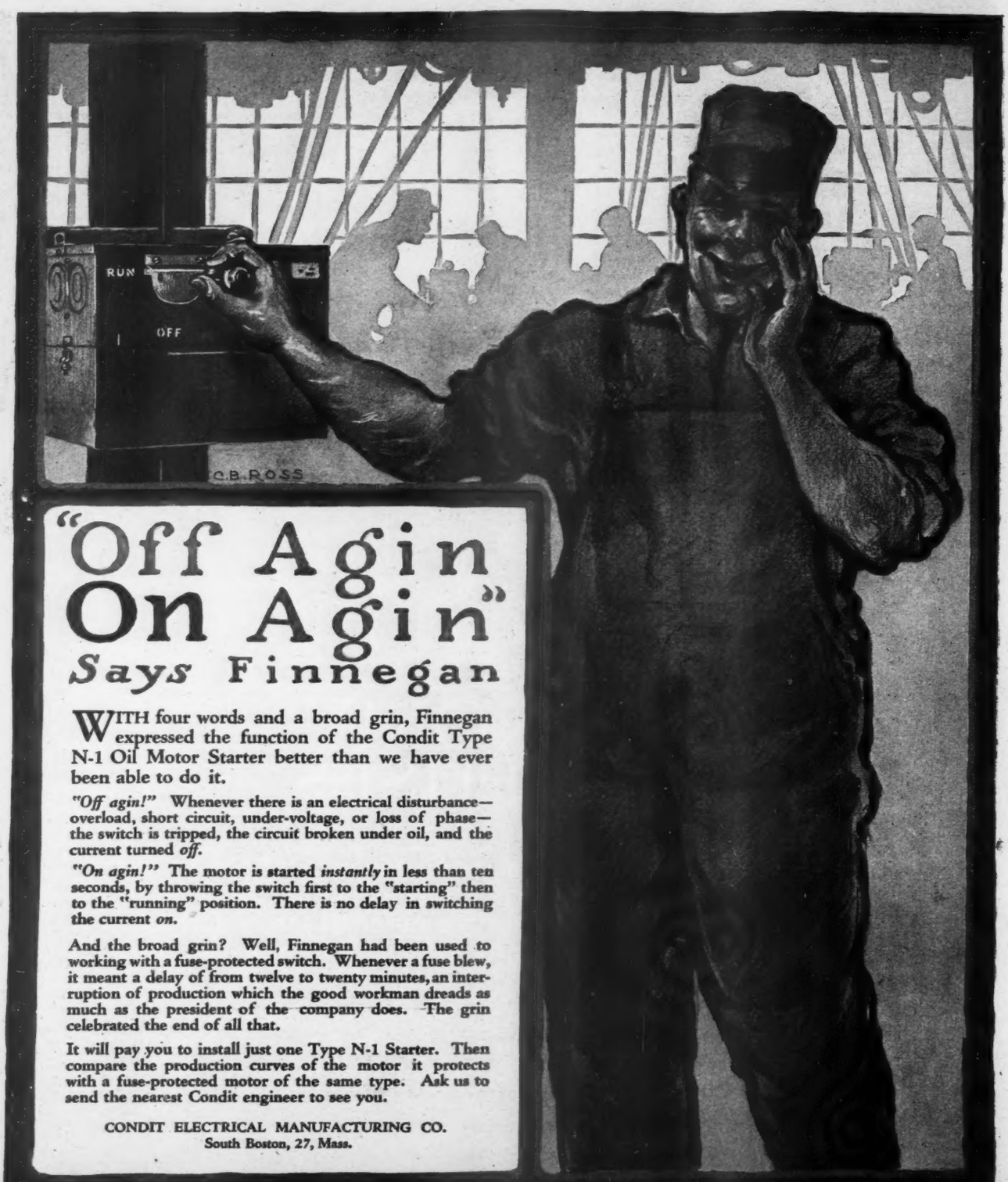
For sale by all leading electrical jobbers and dealers

Economy Fuse & Mfg. Co.

CHICAGO, U. S. A.

Economy Fuses are also made in Canada at Montreal

Economy Fuses were the first line using an inexpensive bare renewal link for restoring a blown fuse to its original efficiency to be approved in all capacities by the Underwriters' Laboratories.



"Off Agin On Agin"

Says Finnegan

WITH four words and a broad grin, Finnegan expressed the function of the Condit Type N-1 Oil Motor Starter better than we have ever been able to do it.

"Off agin!" Whenever there is an electrical disturbance—overload, short circuit, under-voltage, or loss of phase—the switch is tripped, the circuit broken under oil, and the current turned *off*.

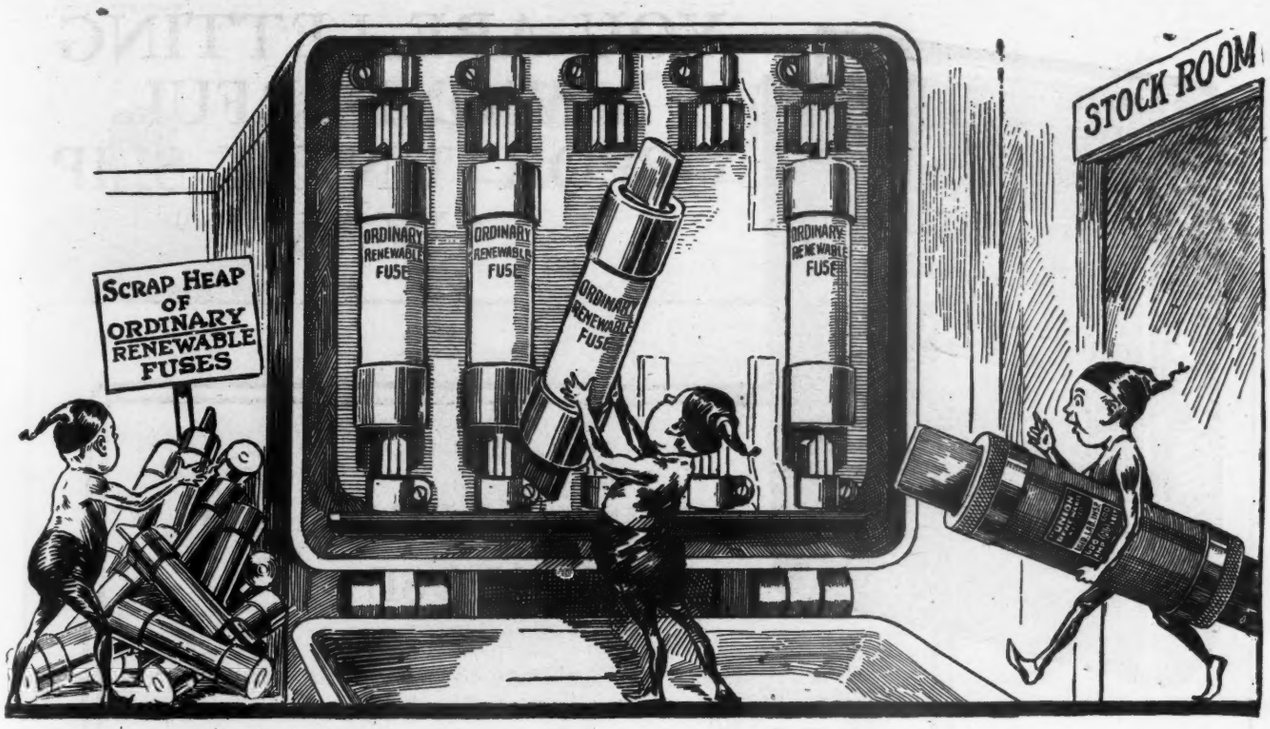
"On agin!" The motor is started *instantly* in less than ten seconds, by throwing the switch first to the "starting" then to the "running" position. There is no delay in switching the current *on*.

And the broad grin? Well, Finnegan had been used to working with a fuse-protected switch. Whenever a fuse blew, it meant a delay of from twelve to twenty minutes, an interruption of production which the good workman dreads as much as the president of the company does. The grin celebrated the end of all that.

It will pay you to install just one Type N-1 Starter. Then compare the production curves of the motor it protects with a fuse-protected motor of the same type. Ask us to send the nearest Condit engineer to see you.

CONDIT ELECTRICAL MANUFACTURING CO.
South Boston, 27, Mass.

CONDIT



Save the Money You Waste This Way

Thousands of dollars worth of perfectly good Renewable Fuses are consigned to the scrap heap every year, when they could be made almost as good as new for a few cents by replacing the blown link with a new one.

One concern, alone, recently found good fuses valued at $392.00 waiting for the junk man to cart them away. And they learned on investigation what many other firms have discovered—that the renewable fuses they were using had so many complicated parts which stuck and were hard to move that the workmen would discard them and put in a new fuse when they blew rather than bother to insert a new link.

It's different with "Union" Renewable Fuses. They have no intricate parts. The nuts and screws will not become fused and corroded from heat and gases when the fuse blows because they are too far from the metal to cause trouble and there is no flash or violent explosion—the *center* of the link melts. Repeated tests by fuse users have proved "Unions" to be the quickest and easiest to renew.

"Union" Fuses, both Renewable and Non-Renewable, are for sale by all leading electrical jobbers and dealers. They are approved in the very highest degree by the National Board of Fire Underwriters.

Free descriptive booklet sent on request.

CHICAGO FUSE MFG. CO.

Oldest and largest manufacturers of Fuses, E'ectrical Protecting Materials and Conduit Fittings.

CHICAGO **NEW YORK**

"UNION" RENEWABLE FUSES

YOU ARE LETTING A WONDERFUL OPPORTUNITY SLIP AWAY

FORMS ABOUT TO CLOSE

HERE is a chance to place your catalog exhibit continually before the man who buys—the man who needs your product—and you are letting it go.

The Electrical Blue Book is a handbook to the Electrical Field.—It is read by Purchasing Agents, Department Heads, Contractors, Central Station Operators, Government men and Electrical men everywhere, because of its authoritative columns on the National Electrical code with it's changes and revisions, because of the Buyers' Index of Electrical Manufacturers—because of the list of Electrical Jobbers, Alphabetical Index of Catalog exhibits and list of approved fittings, material and data that every electrical man uses. If your page is in this comprehensive, highly desirable volume your display is appearing constantly before thousands of the men that need your goods.

CATALOG EXHIBIT RATES

1 page	$125.00
2 pages, each	115.00
3 pages, each	110.00
4 pages, each	105 00
5 pages, each, or more	100.00

Size of type page, 7x10 inches

DELAY IS COSTLY

Don't delay longer; the forms are about to close and your exhibit should be among those already in.

There is yet time but haste is necessary.

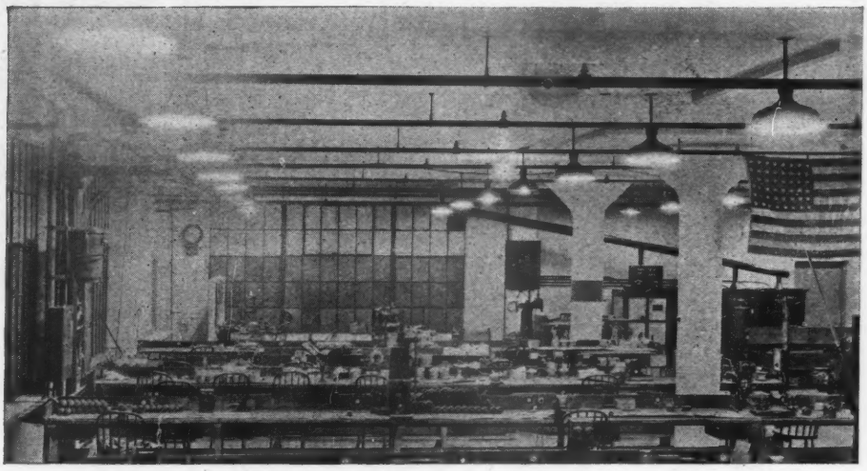
Take your space in The Electrical Blue Book at once.

ELECTRICAL BLUE BOOK
PUBLISHED BY
INTERNATIONAL TRADE PRESS, Inc.
542 MONADNOCK BLOCK, CHICAGO

ABolite Interchangeability

ABolite Reflectors are interchangeable with three types of holder sockets; (1) The AB Holder Socket, (2) The Luminous Holder Socket, (3) The AB Shade Holder — and can be furnished in three additional types of one-piece neck construction; (4) The AB Holder Socket (spot welded to the reflector), (5) The Heel Type for Standard Brass Shade Holders and (6) The Drawn One-Piece Neck. ABolite Reflectors are adaptable to Industrial Plants, Sign Illumination, Show Windows, Roadways, Sidewalks, Yardways, Garages, etc.

ABolites Help Industry See



Interior view of the Van Dorn Electric Tool Company Plant, Cleveland. ABolites installed by the Merrell-Sharp Electric Company, Electrical Contractors, Cleveland.

It's Evident That There's Good Light Here

The trim, business-like appearance suggests it—suggests good work—suggests efficiency.

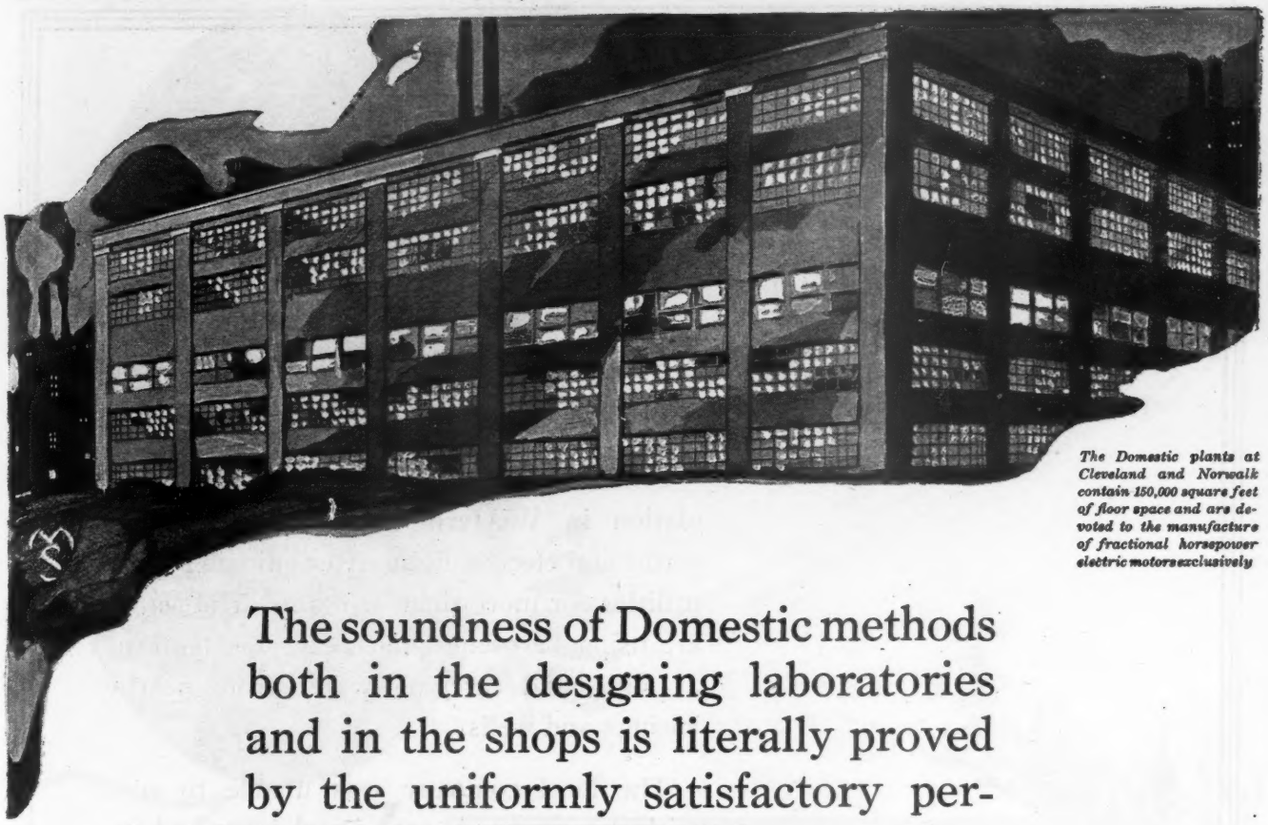
ABolites are chosen for their efficiency. Good lighting protects workmen's eyes, decreases spoilage, means less accidents, better work and more production. Quality products of the Van Dorn Electric Tool Company are a witness to this fact.

All of the desirable features of good reflectors are built into ABolites. The high quality of steel and enamel assures the greatest reflecting efficiency, satisfactory performance and long life under the severest industrial usage. ABolites are easy to install and clean. ABolite interchangeability means an economical and flexible lighting system for both present and future needs.

THE NATIONAL SCREW & TACK CO.
THE AB PRODUCTS DIVISION
(Formerly Adams-Bagnall Electric Co.)
CLEVELAND
Distributors in all principal cities

AB PRODUCTS

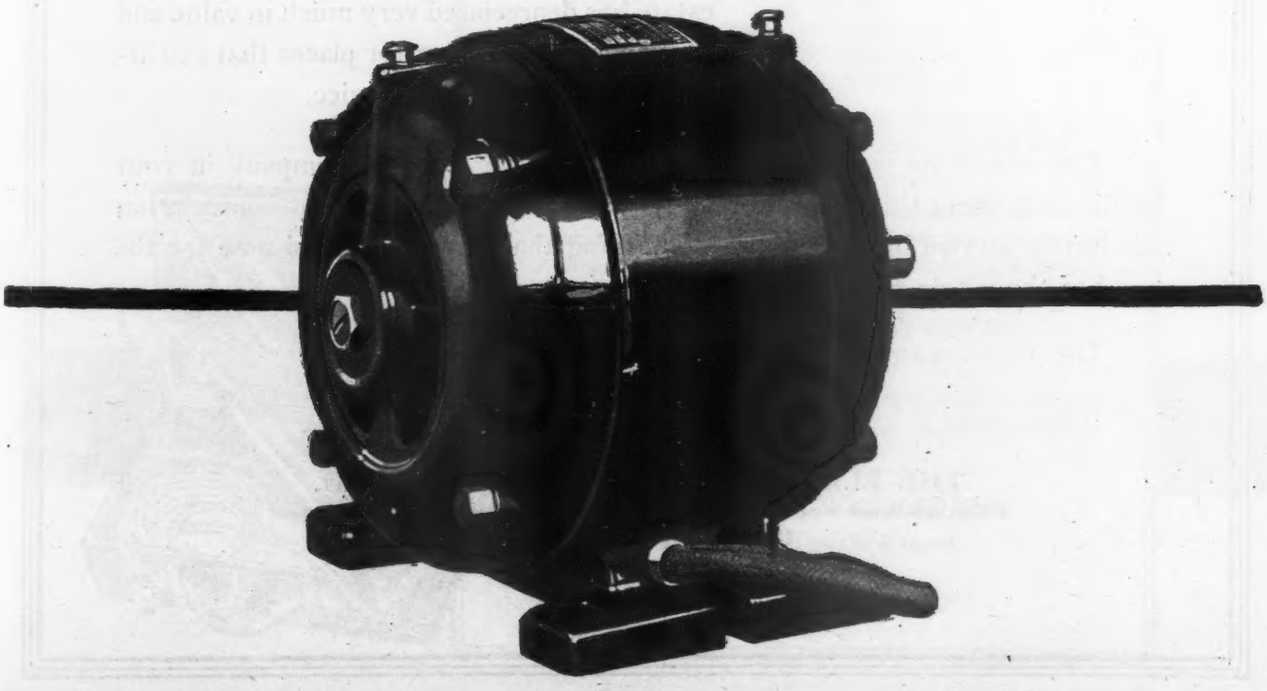
Domestic Electric Motors



The Domestic plants at Cleveland and Norwalk contain 150,000 square feet of floor space and are devoted to the manufacture of fractional horsepower electric motors exclusively

The soundness of Domestic methods both in the designing laboratories and in the shops is literally proved by the uniformly satisfactory performance of the well-known electric washers on which Domestic motors are standard equipment.

THE DOMESTIC ELECTRIC COMPANY, CLEVELAND, O.
FACTORIES AT CLEVELAND, O., AND NORWALK, O.



Keep This Incident in Mind

Here is a little news item clipped from the "News Service Bulletin" April 12, 1920. It carries with it some real food for present day thought.

> CLINTON, KY.—This city of 2,500 population in Western Kentucky is without water and electric light, after enjoying these utilities for more than 20 years. The people are using kerosene lamps, carrying lanterns at night and carrying water from nearby springs and wells.
>
> The local company was unable to cope with the increased cost of coal, labor and operating supplies and had to shut down the plant. The city then undertook to operate the property, but found it too expensive and closed down. The local Commercial Club has raised $10,000 which will be offered as a bonus to anyone who will purchase and operate the plants. Business men say that real estate has depreciated very much in value and that people are leaving for places that can afford substantial utility service.

The next time you hear anyone knocking the lighting company in your locality tell them this little story. It will serve to gain a higher appreciation of electric service by the public—something that is badly needed now for the good of the whole industry.

Don't you want to help?—Carry on the good word.

THE ELECTRIC STORAGE BATTERY CO.

Oldest and largest manufacturers in the world of Storage Batteries for every purpose

1888 PHILADELPHIA 1920

Branches in seventeen cities

Faith

Faith builds the industries of the world—faith in the product and faith in the name behind the product.

"Violetta" is a practical, simple appliance that brings health and satisfaction to every user and extended sales and large profits to every seller.

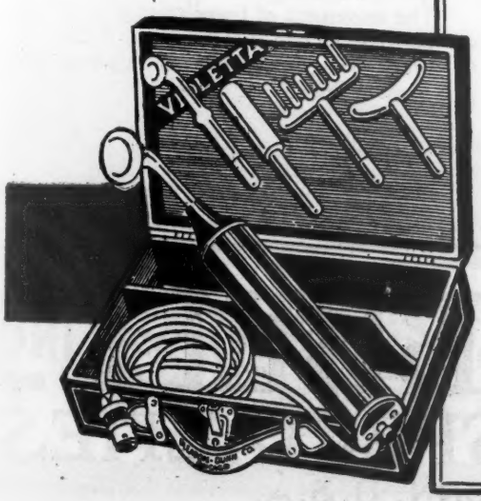
A scientifically designed and constructed instrument that transforms electricity into healing painless violet rays bringing the vigor and happiness of strength to hundreds daily.

The winter athlete knows of its value, the doctor recommends it—answer this demand and let us back you.

Headaches, lumbago, catarrh, insomnia, nervousness and constipation disappear with its use and pimples, eczema, blackheads and similar blemishes are speedily removed.

BEAUTIFYING—HEALTH GIVING—APPEALING.

Our new Co-operative Jobber-Dealer sales campaign will interest you—let us give you all the particulars.



BLEADON-DUN COMPANY
211-217 S. Peoria Street
CHICAGO

HUBBELL
"Quickcatch"
Pull Socket
No. 3618

Did you ever take one apart?

Hubbell Pull Sockets are *reliable.* The make and break are positive—the chain always returns full distance, and does not gag or jam—the bulb or plug makes a firm tight contact, which cannot be shaken loose.

Hubbell produced the first pull socket so thoroughly planned that no material improvements have been possible. Today the Brass Shell Pull Socket No. 3618, Key Socket 3664, and Keyless Socket 3667 are representative of a line complete for every requirement, and fitting every style of standard "Quickcatch" cap or base.

And the Quality?—*Hubbell*

A "Quickcatch" Socket

A press of the thumb releases the cap or base. The contact screws cannot drop out in wiring. Hubbell "Quickcatch" Sockets are National Electrical Code standard. To secure the genuine Hubbell be sure that the globe trade mark is stamped on the brass shell.

A faultless mechanism

The chain operates a ratchet which in turn acts against two phosphor bronz contact springs, opening and closing the circuit. The movement of these springs is always positive, in one direction, the make and break being instantaneous whether the chain is pulled fast or slow.

Key to drawings

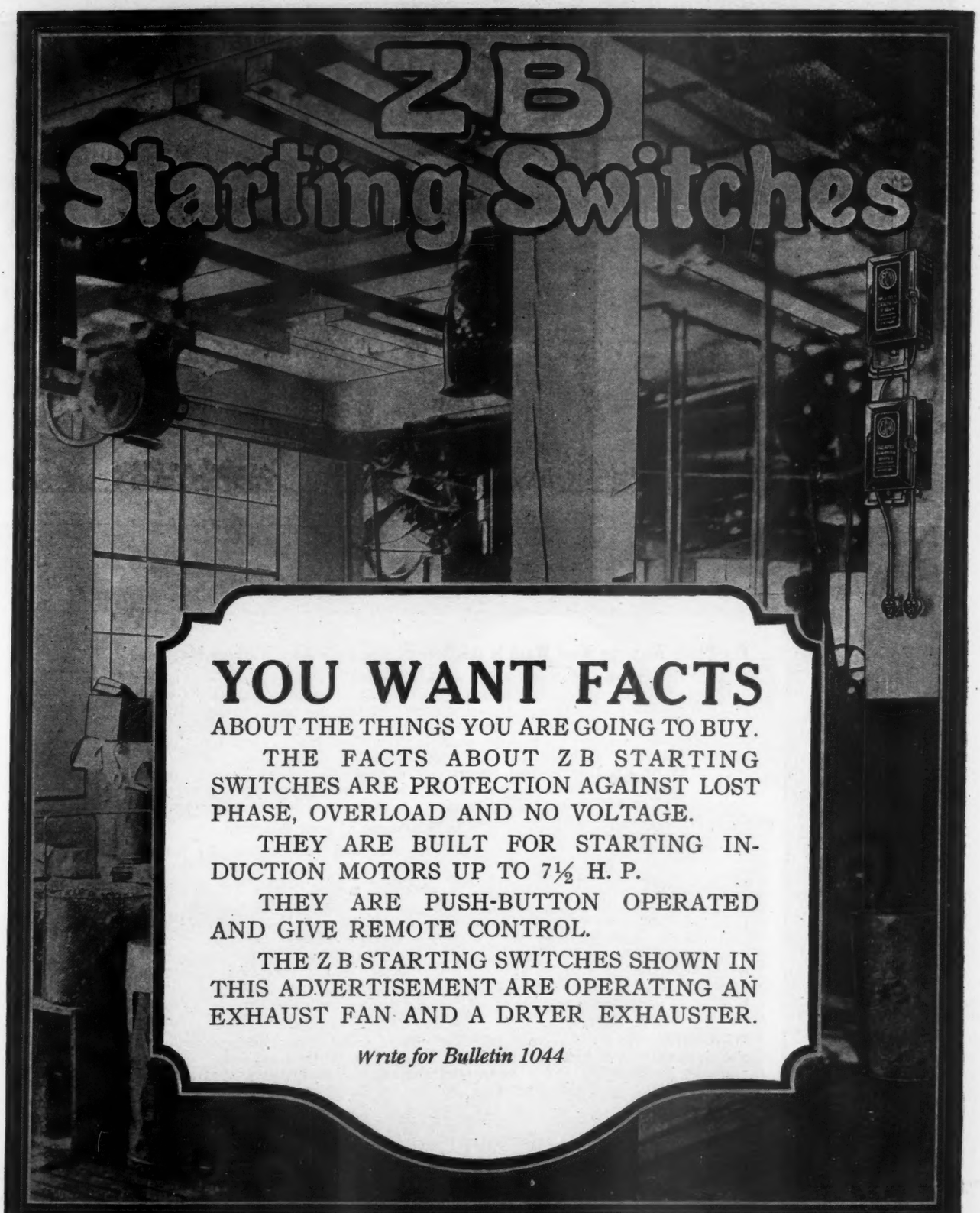
- Parts shown in white carry no current
- Parts shown in gray carry current
- Parts shown in solid black are of dielectric material

Look for the acorn→

HARVEY HUBBELL INC
ELECTRICAL SPECIALTIES
BRIDGEPORT HUBBELL CONN. U.S.A.

REG. U. S. PAT. OFF.

2112-U



YOU WANT FACTS

ABOUT THE THINGS YOU ARE GOING TO BUY.

THE FACTS ABOUT ZB STARTING SWITCHES ARE PROTECTION AGAINST LOST PHASE, OVERLOAD AND NO VOLTAGE.

THEY ARE BUILT FOR STARTING INDUCTION MOTORS UP TO 7½ H. P.

THEY ARE PUSH-BUTTON OPERATED AND GIVE REMOTE CONTROL.

THE ZB STARTING SWITCHES SHOWN IN THIS ADVERTISEMENT ARE OPERATING AN EXHAUST FAN AND A DRYER EXHAUSTER.

Write for Bulletin 1044

E&M

THE ELECTRIC CONTROLLER & MFG. CO.

CLEVELAND, OHIO.

BIRMINGHAM - BROWN-MARX BLDG.
BOSTON - 49 FEDERAL ST.
CHICAGO - CONWAY BLDG.
CINCINNATI - 1ST NATIONAL BANK BLDG.
DENVER - GAS & ELECTRIC BLDG.
DETROIT - DIME BANK BLDG.
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ST. LOUIS - 208 N. BROADWAY
SALT LAKE CITY - BOSTON BLDG.
SAN FRANCISCO - CALL BUILDING
SEATTLE - 524 1ST AVE. SOUTH
TORONTO - TRADERS BANK BLDG.

E&M

The Place With the Most Wash is the Best Prospect for Any Washing Machine.

DEALERS: Here we have a super wash machine—"The Marlow"—it is the only machine on the market which washes the clothes and extracts the water ready for ironing in sufficient capacity to satisfy the commercial trade. It does it all with the least operating expense. Listen: Mr. Schuder is washing with one "Marlow," wash for which he paid $7500 annually to a laundry. He is using a "Marlow" 14 hours per day every day in the week. The "Marlow" has a capacity of 200 Double Bed Sheets per day—4000 napkins per day or its equivalent—it saves 40 to 60% of laundry bills after operating expenses are deducted. You may use this statement as a basis in soliciting your business.

"What's your laundry bill?" should be the slogan of your salesmen.

In addition there is a large saving in the wear and tear and in the loss of sending linen out.

HERE ARE YOUR "MARLOW" PROSPECTS:

There are 25,000 hotels in this country—not even 20% are supplied with wash machines. There are 12,000 hospitals here—75,000 restaurants, thousands of social clubs, barber shops, charitable institutions, newspaper offices, where wiping rags are used, large homes, and all places where linen is used in quantities. The sale of a "Marlow" ironing machine always accompanies a sale of a "Marlow." The sales per equipment is about $1000 and sometimes is even $2000. In fact, there is $200,000,000 worth of business that can be absorbed in this country.

DEALERS: Here is an opportunity for you to secure extra business. This is the time when a reduced laundry cost should appeal to everybody. Do you want to be headquarters in your territory for this exclusive proposition? If you do it will hardly be necessary for us to suggest prompt action.

MARLOW MANUFACTURING CO.
CLEVELAND, OHIO

NEW WASHER

Drys as it washes, leaving the clothes just right for ironing in three to five minutes. Designed so that a minimum of care will make it last a generation and built to appeal to the critical eye and to satisfy the most skeptical user.

Patents granted and applied for.

THE PRINCIPLES AND CALCULATIONS OF ELECTRIC POWER TRANSMISSION

403 PAGES
ILLUSTRATED
6x9

$4.00
NET
POSTPAID

Second edition of Professor Still's "Over Electric Power Transmission." The book covers both overhead and underground systems. An entire chapter on Underground Conductors has been added.

The Author—Professor Still is Professor of Electrical Design, Purdue University. For years he has been a specialist on high tension transmission. He has been associated with many important hydroelectric and transmission projects in England, Canada and the United States.

His wide experience enables him to view the problem broadly and emphasize each of the factors to be considered in planning an economical, safe and efficient line.

CONTENTS

1. Introduction and General.
2. Electrical Principles and Theory—Elementary.
3. Economic Principles and Calculations.
4. Electrical.
5. Insulation of Overhead Transmission Lines.
6. Protection Against Lighting-Transient Phenomena.
7. Transmission of Energy by Underground Cables.
8. Transmission of Energy by Continuous Currents.
9. Mechanical Principles and Calculations—Overhead Conductors.
10. Transmission Line Supports.

Appendix 1. Inductance of Transmission Lines with Any Arrangement of Parallel Conductors.
Appendix 2. Specification for Wood Pole Transmission Line.
Appendix 3. Specifications for Steel Tower Transmission Line.

This book is indispensable to the line engineer. Get your copy at once.

International Trade Press, Incorporated

542-53 MONADNOCK BLOCK

CHICAGO

Ready!

The Metal Molding Hand-Book

"For the Man on the Job"

Every contractor and wireman in the business needs this new Hand-Book—the most complete book ever issued on the subject of metal raceways for surface wiring. It gives full instructions—with many illustrations—for using National Metal Molding under all conditions. It also lists the various fittings and devices that are used in connection with Metal Molding. Because of its convenient size, the book can be easily carried and used right on the job. We will be glad to send you a copy, without charge. Write, or use the coupon below.

Fill in, tear out and mail this coupon.

National Metal Molding Co.

1115 Fulton Bldg., Pittsburgh, Pa.

Please send me a copy of your new Metal Molding Hand-Book: "For the Man on the Job."

Name_____

Address_____

Company_____

The Cave Man Started Something when he accidentally struck the spark that afforded both light and heat. He then set out to control them to his purposes.

Man has struggled with the night all through the ages. The primitive fire baskets, crude splinter holders, open flame oil and grease lamps, candles, kerosene, and various kinds of gas serve as milestones on the road of lighting progress. Each marked a new era in social and industrial development. Then came electricity.

"Artificial Light," by M. Luckiesch of the Nela Research Laboratories at Cleveland, tells the fascinating story. Step by step through the centuries with this distinguished scientist affords an appreciation of the influence artificial light has played on civilization. Its effect on industry, commerce, warfare, navigation, medicine, religion, and the stage, is scarcely realized.

"Artificial Light," by M. Luckiesch, discusses these topics:

Just Return This

↓

Light and Progress
The Art of Making Fire
Primitive Light-Sources
The Ceremonial Use of Light
Oil Lamps of the 19th Century
Early Gas Lighting
The Science of Light Production
Modern Gas Lighting
The Electric Arcs
Incandescent Filament Lamps
The Light of the Future
Lighting the Streets
Lighthouses
Artificial Light in Warfare
Signaling
The Cost of Light
Light and Safety
The Cost of Living
Artificial Light and Chemistry
Light and Health
Modifying Artificial Light
Spectacular Lighting
The Expressiveness of Light
Lighting the Home
Lighting—A Fine Art?

GENTLEMEN:—

Mail a copy of ***"Artificial Light"*** to me.

My remittance of two dollars and a half is enclosed.*

*Name*_____

*Street Address*_____

*City*_____

Check, Money Order, Stamps or Currency.

41 Illustrations—366 Pages—Cloth Bound

Two Dollars and a Half

Mailed Anywhere

INTERNATIONAL TRADE PRESS, Inc.
542-555 Monadnock Block
CHICAGO

Talk Up Your Merchandise and You'll Sell More

Lean right over the counter, use the power of your mind in making the customer realize the pleasure, comfort, and service that he or she will get out of a toaster, grill, percolator or other appliance.

Tell this in such a way that she will get a mental picture of herself in her own dining room using the appliances.

Take Mrs. Jones to the side of the counter, put the C-H Seventy Fifty Switch (attached to one of the cords) in her hand. Her fingers will at once begin to press the buttons. If you have a circuit available let her see how the press of the light button is followed by the pretty glow of the toaster resistor.

This same sort of personal attention, with you and your sales force using the ability you have, will not only sell appliances and C-H Seventy Fifty Switches, but other products as well.

Now is the time to develop the latest art of selling merchandise. Get your force together and show them how.

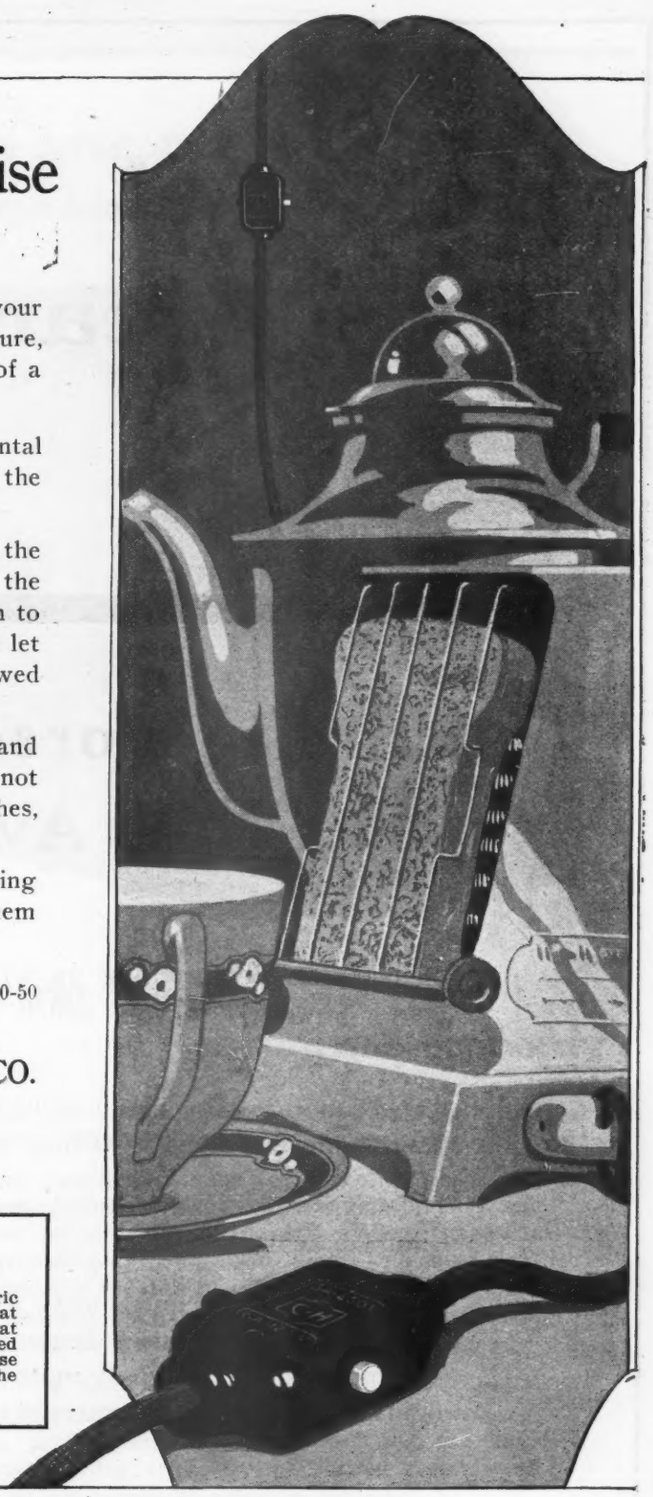
(If you haven't the latest metal display cabinet for C-H 70-50 Switches ask your Electric Supply Jobber.)

Made by THE CUTLER-HAMMER MFG. CO. Milwaukee

In Canada—Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto.

How a Dealer Sold One Dozen Heaters

A New York business man planned giving away 12 electric heaters. Because of his familiarity of C-H 70-50 Switches at his home, his choice of heaters was determined by the fact that one make that the dealer showed him had the cord equipped with a C-H 70-50 Switch. Since a heater gets hot when in use the switch eliminates the liability of getting burnt pulling the connector from the heater.



C-H Seventy Fifty (70-50) SWITCHES

Hear Ye!
Hear Ye!
Hear Ye!

Fractional Horse-Power Motors Now Available

We are rapidly catching up with the demand for fractional horse-power motors on which we were over-sold until very recently.

These motors are now available in A. C. as well as D. C. types, and in all sizes from 1/200 h.p. upward.

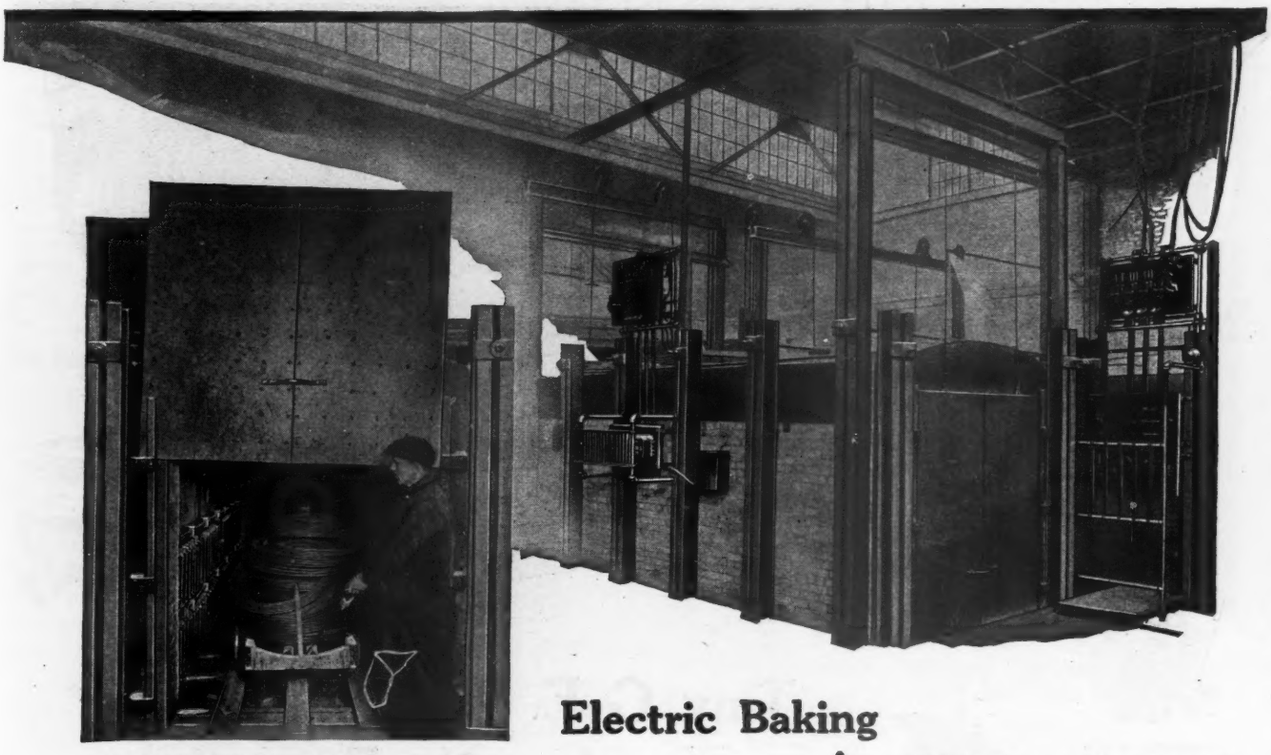
There are also many other types of motors in stock ready for immediate delivery.

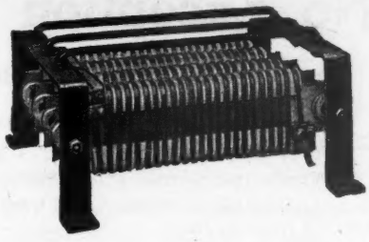
Talk over your requirements with the nearest Western Electric house. It carries large and complete stocks and can promptly supply not only motors but everything else you need in the line of electrical material and equipment.

Western Electric Company
Offices in All Principal Cities

Western Electric

Electric heat, ever ready to serve and easy to control, reduces to a minimum the rejections in industrial baking





Electric Baking is proven economy

THE use of electric heat increases the daily output of the industrial oven without increasing cost.

In wire drawing plants the use of electric heat is saving dies. Before baking, the wire is dipped in acid and then in lime to neutralize the acid. When baked in a fuel oven a hard coating forms which acts as an abrasive, wearing the dies rapidly. Electric baking however, leaves a soft coating which acts as a lubricant when the wire is being drawn through the dies.

The many other advantages of the electric oven—heat furnished by the throwing of a switch, practically perfect temperature control, and the easy duplications, day after day, of desired results—all serve to emphasize its value to industry.

What G-E heating engineers did in this plant, they are ready to do for other industries.

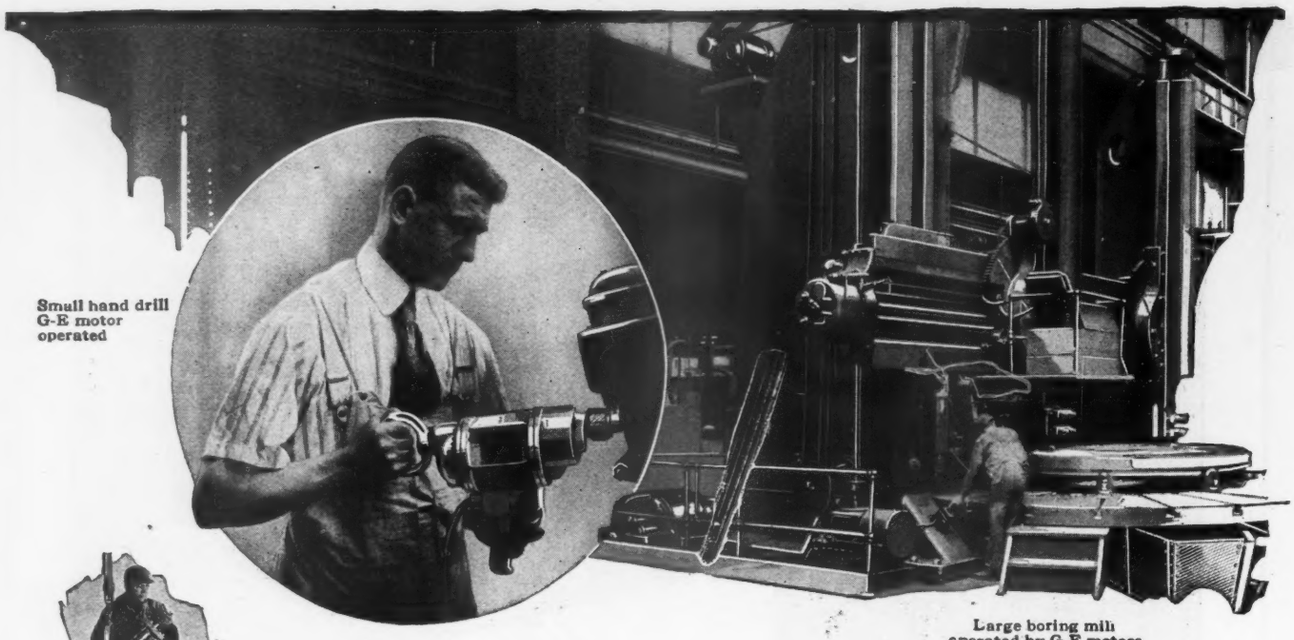
General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

13-54

To build in miniature requires a thorough understanding of the larger models, plus special skill in microscopic detail



Small hand drill G-E motor operated

Large boring mill operated by G-E motors

Portable riveter equipped with 1 H. P. motor

Tapping and drilling machine driven by ⅓ H. P motor

Drill press equipped with G-E motor

Buffing and polishing machine driven by ¼ H. P. motor

Tiny G-E Motors Are No Exception

THE mention of a trolley car, hydro-electric plant, or any other prominent use of electricity, invariably brings the G-E trademark to mind.

But every day this same company is producing thousands of tiny motors as well. The knowledge and research required to build one-twentieth horse-power motors for hand drills or jewelers' lathes may be just as great as that required for a huge boring mill motor or a unit to propel a battleship. The skill and care in manufacture is even more exacting, because of the miniature dimensions and the quantities produced.

Manufacturers of small motor driven devices of the highest grade recognize these facts, and secure the advantages of long time motor service by building G-E motors into their machines.

Inherent quality may not be evident to the casual observer; in fact, the motor itself is often concealed; but the man who investigates, recognizes the value of a quarter of a century's successful production and application of G-E motors to all types of electrically operated machines.

General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

55B-37

Where to Get G-E Service—

Quick service is best obtained from the nearest G-E sales office, distributing jobber, or foreign representative

List of G-E Factories

Connecticut
Bridgeport — Windsor
Indiana
Ft. Wayne — Maryland
Baltimore
Massachusetts
East Boston — Everett
Gloucester — Hudson
Lynn — Pittsfield
Taunton — West Lynn
Missouri
St. Louis
New Jersey
Ampere — Belleville
Harrison — Newark
Roselle Park
New York
New York City — Rochester
Schenectady
Ohio
Cleveland — Sandusky
Pennsylvania
Erie — Philadelphia
Rhode Island
Providence

Works at Pittsfield, Mass. Ground area 88 acres. Floor space, 2,000,000 sq. ft.

For Business in the United States

G-E Sales Office	G-E Distributing Jobber
Alabama, Birmingham	Matthews Elec. Supply Co.
Alabama, Mobile‡	Matthews Elec. Supply Co.
Arkansas, Little Rock	
California, Los Angeles†	Pacific States Electric Co.
California, Oakland‡	Pacific States Electric Co.
California, San Francisco§†	Pacific States Electric Co.
Colorado, Denver†	The Hendrie & Bolthoff Mfg. & Sup. Co.
Connecticut, Hartford	
Connecticut, New Haven	
Connecticut, Waterbury‡	New England Eng. Co.
District of Columbia, Washington	National Elec'l Supply Co.
Florida, Jacksonville	Florida Elec. Supply Co.
Florida, Tampa‡	Florida Elec. Supply Co.
Georgia, Atlanta§†	Carter Electric Company
Georgia, Savannah‡	Carter Electric Company
Illinois, Chicago§†	Central Electric Company Commonwealth Edison Co.
Indiana, Fort Wayne	
Indiana, Indianapolis	Indianapolis Elec. Supply Co.
Indiana, South Bend‡	South Bend Electric Co.
Iowa, Des Moines	Mid-West Electric Co.
Kentucky, Louisville	Belknap Hardware & Manufacturing Co., Inc.
Louisiana, New Orleans	Gulf States Electric Co., Inc.
Maryland, Baltimore	Southern Electric Co.
Massachusetts, Boston†	Pettingell-Andrews Co.
Massachusetts, Springfield	
Massachusetts, Worcester	
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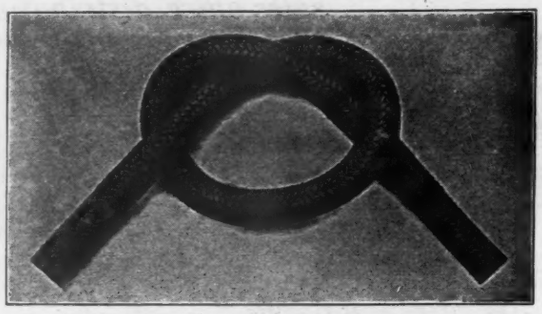

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Poles awaiting cars for shipment to concentration yards.

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Carbosota

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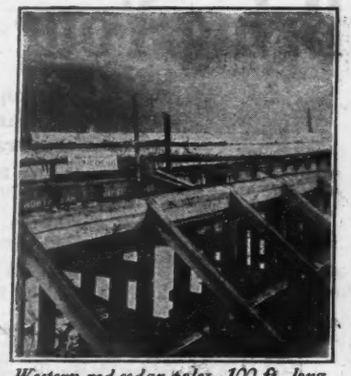
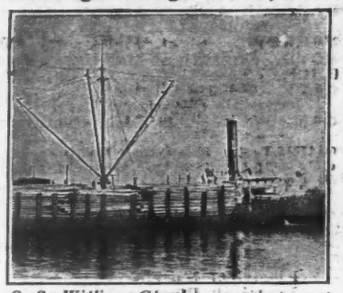


Western red cedar poles, 100 ft. long, awaiting unloading at Everett, Wash.

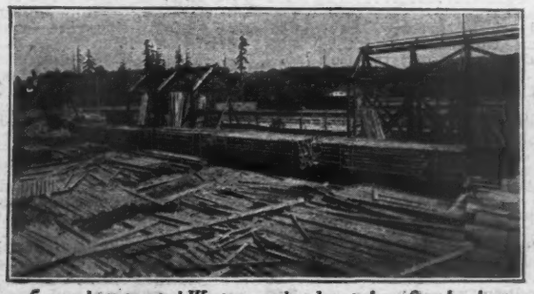


S. S. William Chatham ready to cast off at Everett with largest cargo of poles ever exported from U. S.

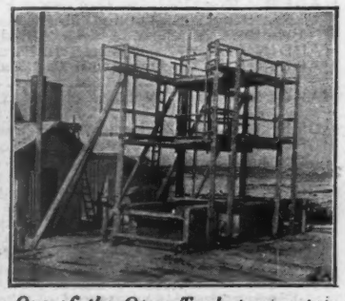
Poles piled for seasoning in concentration yard.

Trainload of butt-treated Western red cedar poles leaving treating plant.

Open Tank process creosoting plant of the Western Pole Preservers, Sandpoint, Idaho.



5 cars butt-treated Western red cedar poles after loading from treating tank. National Pole Co., Everett, Wash.



One of the Open Tank process pole creosoting plants of Baxter & Jordan, Wilmington, Calif.

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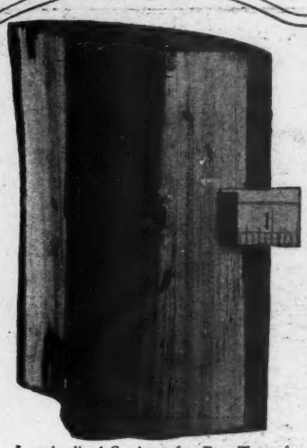

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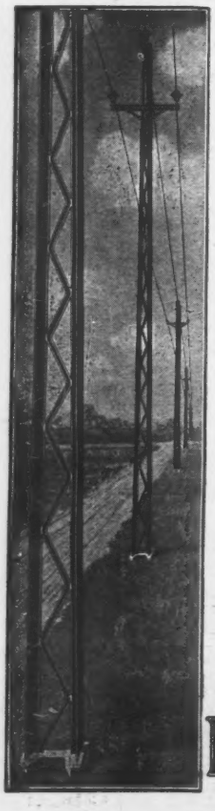

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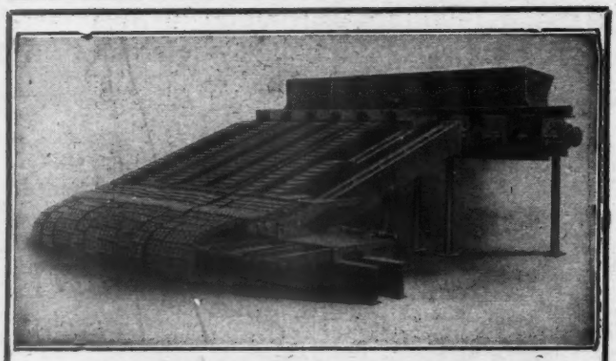

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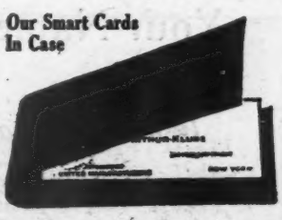

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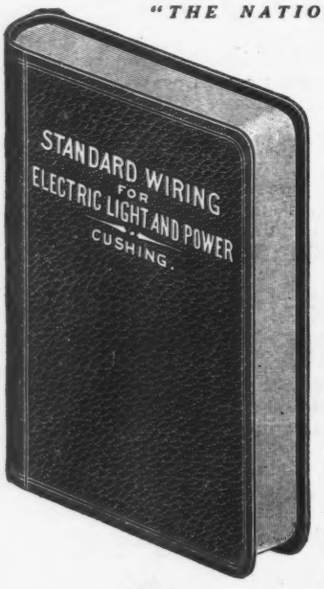

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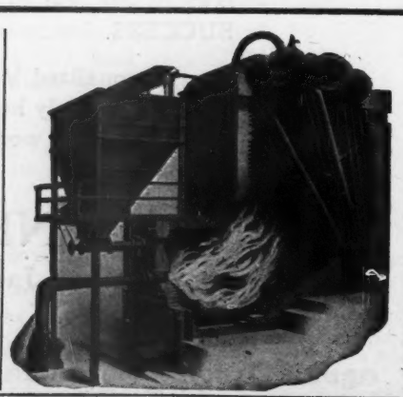

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Hart Mfg. Co.
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Chicago Fuse Mfg. Co.
Cutter Co., George.
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General Electric Co.
Schweitzer & Conrad, Inc.
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General Electric Co.

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Electric Controller & Mfg. Co.
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DEVICES, Wiring.
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Arnold Co.
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Busselle, E. T.
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Cooper & Co., Hugh L.
Croft Eng. Co., Terrill.
Estes, Inc., L. V.
Fowle & Cravath.
Knoeppel & Co., C. E., Inc.
Lyndon, Lamar.
Moore & Co., W. B.
Morse Eng. Co.
Robinson & Co., Dwight F.
Sargent & Lundy.
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White Engineering Corp., The J. G.
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Nordberg Mfg. Co.

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D. & W. Fuse Works of G. E. Co.

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Century Electric Co.
Colonial Fan & Motor Co.
Eck Dynamo & Motor Co.
Emerson Electric Mfg. Co.
General Electric Co.
General Electric Co., Ft. Wayne Dept.
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Electric Controller & Mfg. Co.

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Sherman Mfg. Co., H. B.

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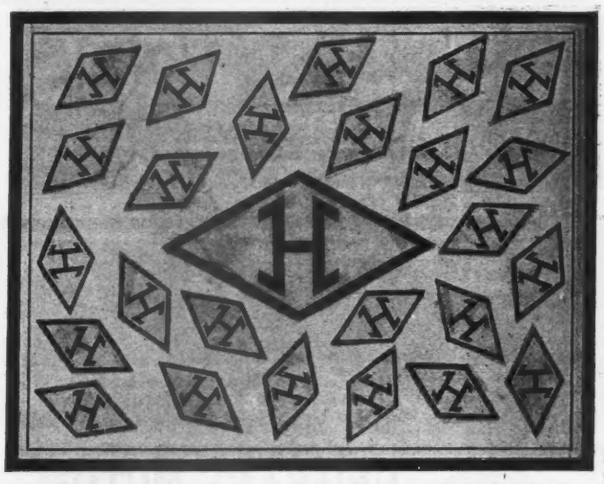

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Electrose Mfg. Co.
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Electrose Mfg. Co.

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Economical Electric Lamp Division.
Federal Miniature Lamp Division.
Flux Miniature Lamp Division.
Festoria Incandescent Lamp Division.
General Incandescent Lamp Division.
Monarch Incandescent Lamp Division.
Munder Electric Division.
Packard Lamp Division.
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Shelby Lamp Division.
Standard Electric Division.
Sterling Electric Lamp Division.
Sunbeam Incandescent Lamp Division.
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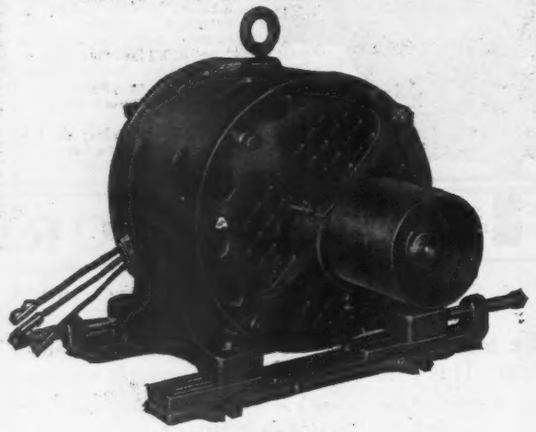

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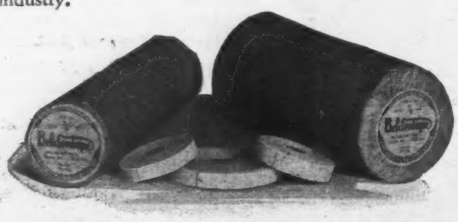

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Ohio Brass Co.
Westinghouse Elec. & Mfg. Co.

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TRUSSES, Roof.
American Bridge Co.

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American Brass Co.

TUBES, INSULATING.
Electrose Mfg. Co

TUBING.
National Metal Molding Co.

TUBING, Condenser.
American Brass Co.

TUBING, Varnished.
Irvington Varnish & Ins. Co.

TAPE, Cambric, Varnished
Irvington Varnish & Ins. Co.

TURBINE GOVERNORS.
Allis-Chalmers Mfg. Co.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

TURBINES, Hydraulic.
Allis-Chalmers Mfg. Co.
Smith Co., S. Morgan.

TURBINES, Steam.
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
General Electric Co.
Kerr Turbine Co.
Moore Steam Turbine Co.
I. P. Morris Dept. of Wm. Cramp & Sons.

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Electrose Mfg. Co.
General Electric Co.

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Apex Electrical Dist. Co.
Electric Vacuum Cleaner Co.
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Hurley Machine Co.
Landers, Frary & Clark.
B. F. Sturtevant Co.
Western Electric Co.

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Irvington Varnish & Ins. Co.

VALVES, Hydraulic.
Cramp & Sons Ship & Engine Bldg. Co., Wm., I. P. Morris Dept.

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General Electric Co.
Sherwin-Williams Co.
Standard Underground Cable Co.
U. S. Rubber Co.
Westinghouse Elec. & Mfg. Co.

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Western Electric Co.
Wisconsin Electric Co.

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Branston Co., Chas. A.
General Electric Co.

VOLTMETERS.
General Electric Co.
Weston Electrical Instrument Co.

WASHERS, Clothes (Motor Driven).
Apex Appliance Co.
Crystal Washing Machine Co.
Federal Sign System (Electric).
Hurley Machine Co.
Locomotive Elect. Washing Machine Co.
Marlow Mfg. Co.
Meadows Mfg. Co.
Remmert Mfg. Co.
Rochester Washing Mach. Corp.
Voss Bros. Mfg. Co.
Western Electric Co.
White Lily Mfg. Co.
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General Electric Co., Ft. Wayne Dept.
Roller-Smith Co.
Western Electric Co.
Westinghouse Elec. & Mfg. Co.
Weston Electrical Instrument Co.

WELDING
Blaw-Knox Co.

WINDERS, Electro-Magnet.
Belden Mfg. Co.
Hubbard & Co.

WINDINGS.
Acme Wire Co.
Belden Mfg. Co.
Dudlo Mfg. Co.

WINDLASSES, Arc Lamps.
Brady Electric Mfg. Co.
Cutter Co., George.
Hubbard & Co.

WIRE, ASBESTOS COVERED.
Belden Mfg. Co.
Marlin-Rockwell Corp.

WIRE, Bare and Insulated.
Acme Wire Co.
Anaconda Copper Mining Co.
[illegible] Brass Co.
American Electrical Works.
American Ins. Wire & Cable Co.
American Steel & Wire Co.
Atlantic Ins. Wire & Cable Co.
Belden Mfg. Co.
Chicago Fuse Mfg. Co.
Collyer Insulated Wire Co.
Copper Clad Steel Co.
Detroit Ins. Wire Co.
General Electric Co.
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Nat'l Metal Molding Co.
New York Insulated Wire Co.
Okonite Co., The.
Page Steel & Wire Co.
Phillips Wire Co.
Roebling's Sons Co., John A.
Rome Wire Co.
Safety Insulated Wire & Cable Co.
Simplex Wire & Cable Co.
Standard Underground Cable Co.
Western Electric Co.
Westinghouse Elec. & Mfg. Co.

WIRE, Copper Clad.
Copper Clad Steel Co.
Page Steel & Wire Co.
Standard Underground Cable Co.

WIRE, Enameled.
Acme Wire Co.
American Steel & Wire Co.
Belden Mfg. Co.
General Electric Co.
Philadelphia Ins. Wire Co.
Roebling's Sons Co., John A.
Rome Wire Co.
Westinghouse Elec. & Mfg. Co.

WIRE FENCING.
Page Steel & Wire Co.
Roebling's Sons Co., John A.

WIRE, MAGNET.
American Brass Co.
General Electric Co.
Roebling's Sons Co., John A.
Rome Wire Co.

WIRE, STEEL.
Page Steel & Wire Co.
Roebling's Sons Co., John A.

WIRE, Telephone, Inside Annunciator and Office.
American Brass Co.

WIRE, Trolley.
American Brass Co.
Rome Wire Co.

WIRE, Welding.
General Electric Co.
Page Steel & Wire Co.
Roebling's Sons Co., John A.

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Manhattan Electrical Supply Co.
Thordarson Electric Mfg. Co.

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Barrett Company, The.

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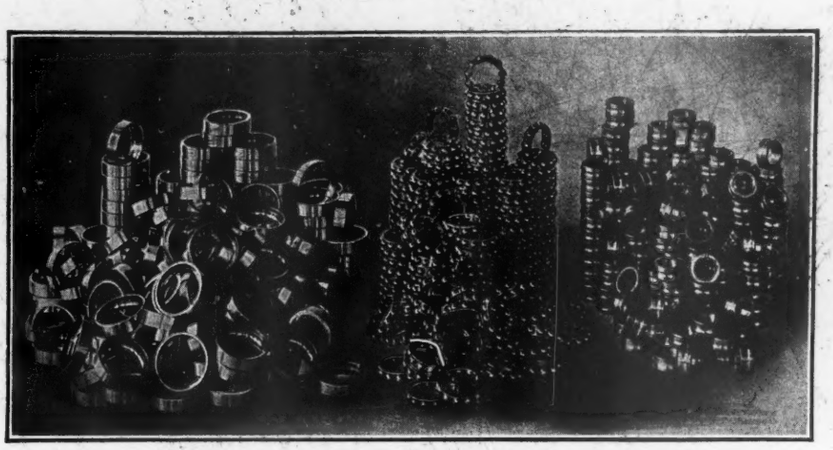

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And any inner race from this pile.

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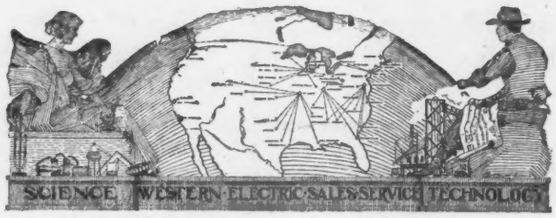

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